

A
TREATISE
ON THE
ANATOMY AND PHYSIOLOGY
OF
THE TEETH,
&c. &c.
THEIR DISEASES AND TREATMENT.
WITH
PRACTICAL OBSERVATIONS
ON
ARTIFICIAL TEETH,
AND
RULES FOR THEIR CONSTRUCTION.

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BY DAVID WEMYSS JOBSON, M. R. C. S. E.

DENTIST IN ORDINARY TO HIS MAJESTY,  
AND TO HIS ROYAL HIGHNESS THE DUKE OF SUSSEX, ETC.  
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1844.

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TREATISE

OF THE

ANATOMY AND PHYSIOLOGY

THE TEETH,

AND

THEIR DISEASES AND TREATMENT.

BY

THEODORE SWIFT, D.D.

AND

ARTIFICIAL TEETH

BY

WILLIAM FORBES, D.D.

BY DAVID WELLES, M.D.

REVISED BY

JOHN W. WELLES, D.D.

BALTIMORE:

PUBLISHED BY

THE AMERICAN SOCIETY OF DENTAL SURGEONS.

NEW YORK: 1854.

1854

TO
THE RIGHT HONORABLE
THE EARL OF CAMPERDOWN.

MY LORD,

I should not have ventured, from the recollection of lasting obligation, to have inscribed to your Lordship a work so limited in its nature and object as the following, were I not aware of the interest which your Lordship feels in the productions of all classes of your countrymen.

On this ground alone, I respectfully beg leave to avail myself of your Lordship's permission, to dedicate it to you.

I have the honor to be, My Lord,

Your Lordship's

Obliged and Obedient Servant,

DAVID WEMYSS JOBSON.

109, GEORGE STREET, EDINBURGH,
March, 1834.

P R E F A C E .

IN submitting these pages to the public, the author is aware that he has been preceded in many of his observations, by those which occur in the writings of Hunter and of Fox. Numerous improvements, however, have been made, in every department of the dentist's profession, since the publication of these standard works, and they do not appear to have been adequately noticed by subsequent writers ; with the exception, indeed, of Mr. Bell, whose able work on the teeth is worthy of being placed by the side of either of those of his predecessors, both in point of the accuracy of his observations, and the scientific mode in which they are conveyed.

These writings might have rendered any other superfluous, were it not for their elaborate detail ; which, however acceptable it may be to the profession, has perhaps prevented their being studied, by medical practitioners at large, with the attention which they merit. This may account for the indifference, or rather the ignorance, which a great majority of general practitioners display, both of the nature of the teeth, and of their affections. Such neglect, at the present day, is the more surprising, when it is considered with what attention they were regarded, two-thirds of a century ago, by the celebrated surgeon, John Hunter, whose work on the teeth may be considered as the basis on which almost all our subsequent knowledge has been raised ; and, like all his other writings, is so strikingly characterized by that power and originality of genius, which reflected light on every subject on which it rested.

If the present elementary outline, founded chiefly on his views, shall have the merit of imparting to the medical student and general practitioner some knowledge of a branch of the profession which is daily becoming of wider importance, one of my chief objects will be fully accomplished.

But though generally following the views of Hunter and his successors, I have endeavored to avoid several inaccuracies into which they seem to have fallen. The opinion which Hunter held of the non-vascularity of the teeth, has been since demonstrated to be so erroneous, that any notice of it now, may be considered as out of date. In other respects, the remarks I have made on the structure of the teeth, and the mode of treating their affections, will be found to be nearly in unison with theirs; as experience has proved the former to be just, and the latter to be at least equal, in point of efficiency, to any that has been subsequently recommended.

My observations upon Artificial Teeth, I think, will be found to be more explicit than those of any preceding author; and it has been my aim to render what I have said, not only upon this subject, but on every other which usually falls under the notice of the dentist, as far as possible, of a practical nature. At least, I can confidently assert, that the directions which I have proposed for the construction of these, have been given without any of those illiberal attempts at mystification, with which almost all writers on this subject have hitherto studiously enveloped their description.

As the principal merit of an outline of any science consists in its being coeval with the discoveries of the day, it will be necessary to notice in these pages several innovations which have been made since the time of Hunter and Fox. The chief of these is the new mode of stuffing the teeth by means of "anodyne cements,"* and "mineral pastes," recently so much in vogue. Of

* The term "anodyne cement," was originally applied to a substance discovered by a gentleman of the name of Clark—formerly a teacher in Inverness Academy,† but now a dentist of eminence in London. He has not divulged its composition; but it is supposed to be extremely simple in its nature, and even by many asserted to be merely a mixture of lime and egg.

The success attending the novelty of his practice immediately set all the empirics of the age in commotion. Accordingly a host of imitators started

† I trust Mr. Clark will not consider this remark invidious. It is really necessary, to distinguish him from other practitioners of the same name.

these poisonous amalgams of mercury with lead, and other equally deleterious metallic oxides, I own I know but little, and have no desire whatever to have the knowledge increased. Such compounds have never been countenanced by any enlightened member of the profession, and are now rapidly falling into merited disgrace.

D. W. J.

109, GEORGE STREET, EDINBURGH,
February, 1834.

up; every one of whom, successively, has without hesitation claimed the discovery as his own, and appropriated the name of "anodyne cement," to his irritating and poisonous compound. Nay, some of them are said to have carried the deception so far as to assume the inventor's name.

Mr. C. has thus, in defence of his "Cement," had to contend with rivals, infinitely more numerous than the cities (*magna componere parvis*) which contested with Athens for the honor of giving birth to Homer, or the Italian towns for the burial of Tasso.

These are the "Marvellous Anodyne Cements," and "Infallible Mineral Succedanea," with glowing puffs of which every daily, hebdomadal, and monthly journal teems; and the unblushing reports which their veracious authors advertise of their efficacy, would be wonderful indeed, if—in newspaper verbiage—they were true.

It is but justice to Mr. Clark to state, that his mode of applying the "cement," is materially different from that of the persons alluded to. The "cement," I am informed, is, by him, chiefly used as a temporary stuffing for alleviating the pain, before permanently stopping the tooth with gold; which, I believe, he afterwards does in the usual way. This mode of practice is, of course, highly lucrative, as it requires numerous applications, and frequent attendance. The practice of his rivals is much more expeditious. They at once plug up the cavity with their nostrum; leaving the caries—the source of the disease—unremoved. The decay thus goes on, in the interior of the tooth, more rapidly than ever. They, moreover, invariably "finish" on the first visit; being well aware that their patients will rarely indulge them with a second.

PART I.

THE ANATOMY AND PHYSIOLOGY OF THE TEETH, &c.

CHAPTER I.

ON DENTITION.

Of the First Dentition—Its frequent danger—Severe Constitutional Sympathy attending it—Prevention of this, and Mode of Treatment—Remarks on the Second Dentition—Pain arising during the advance of the Wisdom Teeth—Means of Alleviation.

THERE is perhaps no period of life so critical to the child, and interesting to the parent, as that of the first dentition. The delicate organization of the body—at all times highly susceptible—seems to be peculiarly sensitive at the period when nature ordains that the infant shall no longer be nourished by the breast of its mother; when the tongue and lips shall no more be used only for suction, but its mouth provided with the instruments requisite for the coarser food, on which the child is destined henceforth to subsist.

The advance of the teeth is generally attended with some considerable sympathetic affection of the constitution, which is usually in a greater or less degree, according to the strength or the debility of the infant. In robust and healthy children the irritation is in general slight, although even in these there is occasionally considerable constitutional derangement.

For some time before the teeth appear, the child becomes fretful, and exhibits considerable tenderness of the gums, with a tendency to carry its hands, or any thing within reach, to the mouth. There is at the same time, an increased discharge of the saliva, occasionally accompanied with a gentle fever, trifling eruption of the skin, and slight diarrhœa.

These symptoms are not to be considered as dangerous, or even unfavorable; as the increased excretions act beneficially by

diminishing any inflammatory tendency, and they generally subside whenever the teeth perforate the gums.

But when the child is feeble, and the teeth meet with any serious obstacle in their progress, the constitutional derangement becomes much more severe. The sufferings of the infant are extremely acute; its restlessness great, accompanied with distressing cries, and continual moaning. The irritation of the mouth is so great, that the slightest touch occasions violent pain. The inflammation is soon extended to the face and head, and ultimately to the thoracic and abdominal viscera; giving rise to suffusion of the countenance and of the eyes, oppression of the head, difficulty of respiration, accompanied with a harassing cough, quick and fluttering pulse, great heat and dryness of the skin, and finally, high sympathetic fever. The digestive organs are also much deranged, the diarrhœa becomes severe, and the discharges acrid. Violent muscular spasms and convulsions, hourly increasing in frequency and violence, at length supervene, and rapidly prove fatal, unless active measures of relief are immediately resorted to.

Such are the severe constitutional symptoms which occasionally arise from a source apparently so trifling as the obstacle which a tooth encounters in passing from its socket to the surface, and which but too often terminate only at the moment when the little sufferer ceases to exist.*

TREATMENT.

The whole of these distressing symptoms may be in a great measure prevented by the timely scarification of the gums.

Whenever the restlessness of the child—its frequent application of the fingers to the mouth, and a profuse flow of saliva—indicate that something unusual is going on, a careful examination of the mouth should be made, and if any of that inflammatory distension of the gums, which is occasioned by the pressure of a tooth, be observed, a semi-lunar incision, or, what is preferable, two crucial ones, should immediately be made over the inflamed part with a gum lancet.

* The occurrence of confirmed hydrocephalus is amongst the most common results of such affections. It appears, indeed, that the irritation of dentition has not been sufficiently attended to as the origin of this disease. Were this view of the case more generally taken, it is, I think, probable that it may in many cases be arrested in its earlier stages, and its dreadful consequences—death, or a state of idiocy, far worse than death—be frequently prevented.

“We frequently find not only constitutions of the most healthy character thus become the subjects of the most acute forms of disease, but also that the latent seeds of scrofula, and other malignant constitutional disorders, are frequently brought into action by this cause.”—T. BELL.

The relief thus afforded is immediate; and it is surprising, indeed, that prejudice should ever be prevalent against a mode of treatment so beneficial to the infant sufferer. Nevertheless this absurd prejudice often exists to a great extent on the part of the mother or the nurse, from the supposition that the operation is productive of much pain to the child. Now the pain arising from scarification is inconsiderable, and but momentary, and the child would probably cry as much were its gums pressed lightly with the finger instead of the lancet; while the relief which the operation affords is great and permanent.

But when, from the neglect of this trivial operation, those dangerous symptoms, already enumerated as attendant on dentition, have appeared, the most active constitutional, as well as local remedies, must immediately be resorted to, to save the life of the infant.

The child should, as quickly as possible, be placed in a warm bath, for the purpose of causing a determination of the blood to the surface, and thus relieving the difficulty of respiration occasioned by the oppression of the lungs. Blisters should, with the same view, be applied to the breast, to the nape of the neck, or behind the ears, to withdraw, if possible, the irritation from the brain. The bowels must also be attended to; and, to prevent inflammation of them, cathartic and sudorific medicines administered, (calomel, scammony, and antimonial powder.) But if there is any tendency to violent diarrhœa, these must be discontinued, and anti-purgatives and anti-diaphoretics substituted for them. (Of these magnesia, and the pulv. cretæ cum opio, are perhaps the best for the purpose.)

But, above all things, it is necessary to remove the source of the irritation. The mouth should be minutely examined, and if any distension of the gum be discovered, scarification should instantly be performed.*

In fact, I believe that the difficulty and the danger of dentition may always be alleviated, if not wholly averted, by the early use of the gum lancet. The medical attendant of the child should be aware of the period at which the teeth usually appear, and of the order in which they generally perforate the gum. Possessed of

* "The prejudices of former times," Mr. Bell observes, in his able work already quoted, "against this simple, but most efficacious operation, are fast yielding to the frequent evidence of its harmlessness and utility. It is impossible for the most prejudiced to witness the effects which continually result from it, without becoming a convert to its use. In the midst of the most imminent danger, when death has almost been anticipated, as the only relief from severe and hopeless suffering, this simple and trifling operation has, in innumerable instances, restored the young sufferers to their parents, in a state of ease and safety which, in so short a space of time, would scarcely have appeared credible."

this knowledge, he should examine the child's mouth several weeks before the teeth are expected to advance; and, if the slightest indication of undue pressure on the gum is observed, scarification should be effectually performed.

It should be kept in view, that the operation, at this period, is performed, not for the purpose of affording an immediate outlet to the tooth, which is then at a considerable distance from the surface; and, even if it were exposed by the incision, the gum will generally re-unite over it, apparently as firmly as before it was cut; but will afterwards more easily yield to the pressure of the tooth, when ready to advance; in conformity with that well-known law of nature, which ordains, that any part of the body, that has once been wounded, shall ever afterwards possess a smaller degree of vitality, and consequently give way more readily, than the untouched part of the structure.

ON THE SECOND DENTITION.

The second dentition is rarely attended with any of the painful concomitant symptoms of the first. Indeed, the whole of the second set, with the exception of the wisdom teeth, usually perforate the gums without the knowledge of the individual. With the *dentes sapientiæ*, however—which rarely appear until the nineteenth or twentieth year, when almost the whole space, in the maxillary bones, allotted to the teeth, is fully occupied—all the pain of the first dentition is frequently revived.

The irritation produced on the surrounding parts, from want of sufficient room for the advancing teeth, generally gives rise to severe and continued suffering, which is often accompanied with much inflammation of the mouth, and considerable swelling of the face. I can, unluckily, speak of this from experience, having suffered severely while obtaining my own, and witnessed many similar instances; nay, I believe a case is on record, which terminated fatally, from the dreadful inflammation caused by an advancing wisdom tooth burrowing under the large grinder in front of it.

Much relief will generally be derived from scarification of the gum, or by the excision of a small part of it over the expected tooth; though it may sometimes be necessary to extract the second molaris, in order to afford the requisite space.

CHAPTER II.

ON THE STRUCTURE OF THE TEETH.

Of the General Organization of the Teeth—Comparative View of the Teeth in Man, and in the Inferior Animals—General Description of the Teeth; their Formation, Structure, and Chemical Composition—their Osseous Substance—their Enamel.

THE teeth may be defined to be the organs provided for the mastication of substances requisite for the support of life. For this purpose they are admirably adapted, being throughout by far the most solid structure in the body, and externally protected by an enamel, which is one of the hardest substances in nature. They also serve several minor objects, and materially contribute to the beauty of the face, and the perfection of the speech.

There is no other structure in the body to which the teeth bear a near resemblance. They have, it is true, by some writers, been compared to the bones; but they are possessed of a much smaller share of vitality, and have not the power of regenerating themselves, as these do, when injured by disease. By others, again, especially the French authors, they are considered as analogous to the nails and the hair. The analogy, if there be any, is extremely slight, as the teeth are possessed of a far higher order of organization.

On the whole, however, they resemble the bones more than any other part of the body, both in their chemical composition and general structure; being, like these, formed by the union of gelatinous matter with an earthy base; and supplied with blood vessels, nerves and absorbents, from the two first of which they derive their vitality and powers of sensation, and, by means of the last, have their substance removed when it is no longer requisite; as in the case of the absorption of the roots of the first set of teeth, to make way for the bodies of those of the second. Farther than this the resemblance does not extend: the enamel of the teeth is totally different from any other animal substance, and might alone entitle them to be considered as a homogeneous structure.

On this subject, however, I shall not enter into detail, being convinced that it would lead to no practical utility, and would prove infinitely more uninteresting than even the discussion which has been started on the question of the original and natural food of man, as deduced from the structure of his teeth, compared with those of the lower animals; and which, as I shall not swell my

pages by enlarging on it elsewhere, it may be well briefly to notice here.

In the inferior animals, the teeth are found to vary in their form and structure, according to the habits of the animal, and the mode in which it lives. If it is a beast of prey—subsisting on the bodies of others, and using its teeth as instruments of attack and defence—one class of them (the canines) will be found to be extremely large, prominent, and pointed; another (the molares) are also large, irregular on their surfaces, and having numerous prominences or points on their crowns; while the third class (the incisors) are small, and rather imperfectly developed: and the bodies of all the teeth are surrounded by a thick covering of enamel.

But if the animal lives on vegetable productions, and is inoffensive in its nature, the incisor and grinding classes of teeth predominate, and are the most fully formed. Their crowns and edges are also smoother, and less irregular; and the enamel, instead of surrounding the bodies of the teeth, is intermixed in layers with their osseous substance.

In the species of *Rodentia*, again, or gnawing animals, of which the beaver is the most perfect type, the incisors are much more fully developed than any of the other classes; and the enamel by which their bodies are protected is not only extremely hard, but their interior substance also appears to be more dense than in the teeth of other animals. The same structure may be observed in the teeth of the rat, and in all the animals of this class; most of which use these organs, not only for the mastication of their food, but also in the construction of their domiciles, or as instruments for extending their ravages.

These differences in development of the several classes of the teeth will be most strikingly observed, on comparing together those of the animals which are usually considered as the most perfect representatives of the species to which they respectively belong; as, for instance, the horse or the ox in the herbivorous order, and the lion, the emblem of the carnivorous.

The naturalist is thus often enabled, by the appearance of the teeth—which, from their greater solidity, usually remain perfect long after every other part of the body has been consumed—to discover the species to which the animal belongs; and (as in the case of those of antediluvian creation) to form some conception of their nature and habits, although no other traces of their existence remain.

The appearance of the human teeth presents a combination of the leading features of those of the different orders of inferior mammalia, man naturally subsisting both on animal and vegetable productions. The different classes of his teeth are nearly equally

developed, although the one corresponding to that so strikingly marked in carnivorous animals, is the most conspicuous. But they do not exhibit that superiority of formation in one order over that of another, which is so general in the rest of the mammalia; in which that particular class of teeth which is best adapted to the habits of the animal, is always more strikingly developed than any of the others.

GENERAL DESCRIPTION OF THE TEETH.

In describing the appearance of a tooth, it is customary to speak of its *body*, or that part of it which is surrounded by the enamel, and usually projects beyond the gum; and of the *root* or *fang*, by means of which it is attached to its socket. The part where these two unite is termed the *neck* of the tooth; and the most superficial point of its body is named the *edge*, or the *crown*.

The whole of the roots, and all the interior part of the bodies of the teeth, consist of osseous substance; the bone of the latter being, as already observed, surrounded by the enamel. Of this protection the fangs are destitute, as they are wholly osseous. They are, however, more highly organized than any other part of the tooth, as the dental blood vessels and nerves not only pass through them, but they are also surrounded and attached to their sockets by a highly vascular and nutrient membrane, analogous to the *periosteum* of the bones. From this additional source of nutrition, they are possessed of a considerably greater degree of vitality, and are thus often found to be sound and healthy, when the whole of the bodies of the teeth have been destroyed by caries.

In the interior of the fang and body of each tooth, there exists a *canal*, through which the dental blood vessels and nerves extend. These enter by an orifice at the extremity of each root. This part of the canal is, in young teeth, generally the widest; but when the tooth is completely formed, the opening here is usually exceedingly small, and, indeed, often imperceptible. The canal gradually becomes wider in its course, until it reaches the centre of the body of the tooth, where its diameter is greatest, and a little below which it terminates.

The canal is seen to greatest perfection in the adult tooth. After the twenty-first year of age, it gradually decreases in size, and beyond the forty-fifth or fiftieth years, there are rarely any traces of it remaining, excepting a discolored spot in the solid tooth, if it be transversely divided.

The *parietes* of the canal are lined by a highly delicate membrane, similar to the internal periosteum, and forming a sheathe for the blood vessels and nerves on which they ramify before entering the osseous structure of the teeth.

This membrane does not adhere to the interior of the roots

with nearly so much tenacity as that which covers their exterior, but it contributes more highly to the vitality of the teeth. It is possessed of exquisite sensibility, and it is from inflammation of it that the acute pain of tooth-ache arises.

FORMATION OF THE TEETH.

The formation of the teeth commences at a considerable period before the birth of the child; the rudiments of them being found in the embryo at the end of the third month. When first observed, they are pulpy-looking, gelatinous substances, of a pellucid and semi-transparent appearance, extremely soft, and bearing little or no resemblance to the dense and hard bodies they afterwards become.

These delicate rudiments are placed in a groove, or furrow, which, at this early period, extends along the most superficial ridge of each maxillary bone, and constitutes the future alveolar processes, or sockets of the teeth. The pulps are at this period closely surrounded by an exceedingly delicate and vascular membrane, which is, apparently, also generative of them. Numerous small blood vessels ramify on this membrane, and, extending from it, permeate the pulpy body, and afford it nutrition.

Both the pulp and its investing tunic are enclosed in a stronger capsular membrane, which firmly adheres to the gum by one extremity, but at its other, remains unattached in the groove. This capsule derives its origin from the gum, and only loosely envelops the rudimentary pulp; being considerably larger than it, to admit of its growth.

Shortly after the formation of these pulpy substances, ossification commences on them at one or more points, and gradually extends, until the whole of the pulp is converted into bone. The osseous matter now deposited forms the bodies of the future teeth, the roots of which are still unformed, there being neither space nor occasion for them, until the bodies begin to make their way through the gums.

DEVELOPMENT OF THE ENAMEL.

When the ossification of the pulp is completed, all traces of its interior membrane appear to be lost. About the same time a peculiar action seems to take place in the vessels of the inner layer of the capsule; and a greenish coloured, chalk-looking powder, is deposited in successive layers, which rapidly unite into a very hard crystalline substance, the enamel of the teeth.

Although the formation of the enamel is so much later in commencing than that of the osseous part of the teeth, it is yet sooner completed; the enamel being wholly formed at the time that the teeth begin to appear beyond the gum, though little more than two-thirds of their roots are then developed.

These remarks are equally applicable to the first and second sets of teeth; the rudiments of both of which exist in the maxillary bones at the same period; those of the temporary set appearing first, and forming the source from which the permanent teeth are produced.

COMPOSITION OF THE TEETH.

The teeth, as already mentioned, consist of two distinct substances,—bone and enamel. I shall now a little more minutely describe their respective peculiarities and chemical composition.

OF THE OSSEOUS SUBSTANCE.

The osseous substance of the teeth resembles that of the bones, in its general properties and chemical nature; consisting, like it, of earthy matter in union with gelatin. But the teeth contain a much larger proportion of the earth than the bones do; and to this circumstance they owe their greater hardness and durability, which often remain unimpaired, when every trace of the rest of the osseous structure has disappeared.

This osseous matter forms the whole of the roots, and the greater part of the bodies, of the teeth. It is the only part of them that is organized; and that portion of it which forms the roots, appears to be more highly so than the other; as these often remain unaffected, when the bodies of the teeth have been completely destroyed by caries.

As analyzed by the celebrated Swedish chemist, Berzelius, 100 parts of the osseous substance of the teeth consist of—

Phosphate of lime,	62
Carbonate of lime,	5.5
Fluate of lime,	2
Phosphate of magnesia,	1
Soda, and muriate of soda,	1.5
Gelatin,	28
	100

The whole of the calcareous part of the teeth is readily dissolved by any of the stronger acids, but the gelatinous portion is not affected by them; and it exists in so large a quantity, that, when the earthy bases are withdrawn, by placing a tooth in a solution of nitric acid, the figure of the tooth will still be retained, although it is left in a soft and flexible condition.

On the other hand, the gelatin is easily destroyed by exposure to heat; and if a tooth is passed through fire, the calcareous portion only will be left; but the form of the tooth (which has now been rendered hard and brittle) will, as in the former instance, be preserved.

OF THE ENAMEL.

The enamel is the peculiar structure of the teeth, and it is chiefly on the perfection of its formation that their durability and beauty depend.

The manner in which it is formed is extremely mysterious, and is yet far from being thoroughly understood. It has been already mentioned, that, when the osseous part of the bodies of the teeth is completed, a peculiar change takes place in the outer capsular membrane: the inner layer of this either becomes detached from the outer, or a new membrane is given off from it, by which the body of the tooth is closely embraced, instead of being loosely surrounded by the capsule as hitherto. This membrane, whether a new or an old structure, is exceedingly vascular; and its vessels deposit a chalky looking substance, which ultimately is consolidated into the enamel; although it is totally unknown by what mysterious arrangement it happens that those arteries, which formerly deposited an osseous structure, should now create a matter so different, as this vitreous and crystalline substance is.

The enamel is deposited first, and in the largest quantities, on those parts of the teeth which are to be most frequently used, and where they are most liable to be worn down by friction. It will thus be found to be thickest on the edges, and on the anterior and posterior surfaces of the single teeth, and on the crowns of the double ones. The fibres of its crystals are, apparently with the same view, deposited in a peculiar manner, as they diverge from the body of the tooth, like radii from the centre of a circle. From this arrangement, they are not so apt to be splintered by hard substances, nor to be worn down by the constant friction, as they would if they had been deposited in a more perpendicular or horizontal direction.

The enamel is a crystalline vitreous looking body, and, when perfect, is one of the hardest substances in nature. It is transparent, and nearly colourless,—the different hues, which it occasionally exhibits, arising from the shade of the bone beneath. From its hardness, it is susceptible of a high polish from artificial means, and frequently acquires a still higher one in the mouth, from the continued friction of the tongue and lips.

The enamel does not possess much, if indeed any, vitality; neither blood vessels nor nerves entering its substance: but it is endued with the power of communicating external impressions to the nerves in the centre of the teeth. This is especially remarked when any agents, injurious to these, come in contact with it; and the communication gives rise to the familiar sensation, which is popularly expressed by the term of “the teeth set on edge.”

Although the extreme hardness of the enamel, and its crystalline structure, greatly protect it from caries and external injury,

yet they render it exceedingly brittle when it is not supported by the osseous substance. A tooth will thus be frequently broken by a trifling accident, although no appearance of unsoundness had been previously observed. On examination, the enamel will be found to be nearly perfect, while almost the whole of the osseous interior has been excavated by caries.

As analyzed by Berzelius, 100 parts of the enamel contain—

Phosphate of lime,	85.3
Carbonate of lime,	8
Fluate of lime,	3.2
Phosphate of magnesia,	1.5
Soda, and muriate of soda,	1
Water and animal matter, (gelatin,)	1
	100

From this analysis it will be observed, that the enamel consists almost solely of earthy substances, and that the quantity of organic matter is incredibly small. There is no reason, however, to doubt the accuracy of the result which this distinguished chemist has given; although the proportions, which he mentions, are considerably different from those stated by Mr. Pepys, who made a similar experiment on the teeth, in the earlier part of this century, at the request of Mr. Fox, in whose work Pepys' analysis will be found detailed. But that of Berzelius is considered to be the more correct of the two; as he not only discovered the existence of fluat of lime and the salts of magnesia and soda both in the bone and enamel, which Mr. Pepys had failed to detect, but also ascertained the presence of the small proportion of gelatin in the latter, which the English chemist had singularly overlooked.

From the nature of the elements entering into its composition, it will be evident that all the acids will rapidly destroy the enamel. The injurious effects of these, not only when used in medicine, but in the far more reprehensible form of powders for "whitening" the teeth, will afterwards be noticed in another part of the work.

CHAPTER III.

Of the Maxillary Bones—their Alveolar Processes, or Sockets of the Teeth—Attachment of the Teeth to their Sockets—of the Membranes of the Teeth—of the Gums.

I MUST refer to writers on osteology for a description of the maxillary bones, as it would be foreign to the purpose of a work like this to notice them farther than in their relation to the teeth.

It has been already mentioned, that in the embryo, at the end of the third, or in the course of the fourth month, a furrow may be observed extending along the surface of these bones, in which the rudiments of the teeth are placed. Shortly after the appearance of this groove, minute processes gradually project from the opposite sides of it, and, uniting in the centre, divide it into several cavities. These spaces are originally of considerable extent, and each of them generally contains two or three of the teeth; but by a process similar to that by which they were formed, they are increased in their number, and diminished in size, until at last they almost closely surround the teeth, whose sockets they eventually become.

It will not be necessary to give any description of the form and number of these sockets, as they exactly correspond to those of the roots of the teeth which they respectively contain. They are also dependent on the presence of the teeth, and invariably disappear when these have been removed either by disease, by violence, or by age. The latter occurrence, indeed—the falling out of the teeth in old age—solely arises from the destruction of the sockets by absorption.

It is generally supposed that the sockets which had first contained the temporary teeth are afterwards occupied by the permanent. This opinion is altogether erroneous, as each set of teeth has separate sockets of its own. The rudiments of the permanent teeth were, indeed, at first contained in the same cell with those of the temporary; but in proportion as the latter advanced towards the surface, and the growth of the former caused them to occupy a deeper situation in the jaw, distinct sockets were gradually formed for them, by absorption, in the interior of the bone. A communication, however, for some time exists between them by means of the cervix which connects the permanent with the temporary pulp. In proportion as the two sets separate, this cervix gradually lengthens, remaining attached by one

extremity to the rudiment of the permanent, and fixed at the other to the neck of the temporary teeth. This singular chain of communication between the two sets subsists even for some time after the temporary teeth have perforated the gums.

The teeth are attached to their sockets by that kind of articulation which by anatomists is termed *Gomphosis*, being analogous to the manner in which a nail is fixed when driven into a board. The sockets, however, are considerably larger than the roots of the teeth, and the space intervening is occupied by the dental periosteum.

This membrane is in every respect similar to the common periosteum of the other bones. It is highly vascular, and adheres with the greatest tenacity to the fangs of the teeth. From these it is reflected on the sockets, with whose periosteum it imperceptibly unites. The fibrous-looking bands by which it is so firmly attached to the teeth are supposed to consist almost wholly of blood vessels.

This membrane serves the double purposes of affording nutrition to the teeth and retaining them in their places, and their durability is chiefly dependent on its healthy condition. When it is attacked by inflammation, to which, from its great vascularity, it is especially subject, it is apt to separate from the teeth, unless the irritation is early subdued by local bleeding. If the detachment takes place, the teeth are deprived of their principal source of nutrition and support, and either quickly die, or become loose and fall out.

The other membrane is an exceedingly delicate one, existing within the canals in the centres of the teeth. It is highly vascular and exquisitely sensitive, and bears a close resemblance to the internal periosteum of the bones. It does not adhere to the osseous parieties of the canal with nearly so much tenacity as the external membrane does to the roots, but closely embraces the nerves and blood vessels, for which it forms a kind of sheath.

The canal in the centre of the teeth is occupied by this membrane, and the nerves and blood vessels which it encloses. When an opening is made into this cavity by the progress of caries, inflammation of the membrane ensues; which is increased by exposure to the air, saliva, &c. and occasions the familiar disease of toothache. The pain experienced during this affection is rendered the more acute from the circumstance of the unyielding nature of the walls of the canal not permitting of that distension which the increased size of the membrane would require.

THE GUMS.

The gum is a cartilaginous and highly vascular membrane, which surrounds the necks of the teeth, covers the alveolar pro-

cesses, and is thence extended to the lining membrane of the mouth, with which it imperceptibly unites. It consists chiefly of blood vessels, united with a cartilaginous tissue. The florid color of the membrane arises from the great number of the vessels. It is also by means of them attached to the bones, numerous small vessels passing between them.

Though one of the most vascular membranes in the body, it is not proportionably supplied with nerves, and is possessed of little sensibility when in a healthy condition; but when irritated, as during inflammatory affections, it often becomes exquisitely sensitive.

The natural sensibility of the gums is least in infancy, before the teeth have made their appearance; and in old age, after they are lost. At the latter period they appear sometime to lose almost all their power of feeling, as we often find aged persons masticating hard substances with their gums without the least inconvenience.

The use of the gums is to afford support to the teeth, nutrition and protection to the alveolar processes and adjoining parts of the maxillary bones—to all of which they adhere with a considerable degree of tenacity.

CHAPTER IV.

OF THE ORGANIZATION OF THE TEETH.

Of the Dental Blood Vessels—Evidence of Circulation in the Teeth—Of the Absorbent Vessels and Nerves of the Teeth—Intricate connection of the latter with those of other parts—Sympathy arising from this.

THE arteries of the teeth are derived from the internal maxillary, a large subdivision of the external carotid. The teeth of the upper jaw are supplied by the superior maxillary and infra-orbitary branches; the former of which entering the bone by one or two small openings at the back part of its tuberosity, traverses the maxillary antrum, ramifying on its lining membrane, and sends down small vessels to the molares, and usually to the adjoining bicuspidatus. The infra-orbitary artery accompanies in its course the nerve of the same name, and sends down, while passing through the infra-orbitary canal, small branches to the incisors, canines, and anterior bicuspidates.

The inferior maxillary artery is a large branch of the internal maxillary. Entering the jaw by the posterior maxillary foramen, it runs along the canal in the interior of the bone, giving off

branches to each of the teeth in its course; and afterwards emerging at the anterior foramen, it is ultimately distributed on the muscles and integuments of the lips, chin, and upper part of the neck.

On entering the teeth, the arteries generally unite with the nerves to form the delicate pulpy body which fills the dental canals. Frequently, however, they hold a separate course, and may occasionally be observed imbedded in the centre of the nerve, on cutting across a living tooth, or when one of the teeth has been accidentally broken over.

The blood is brought back from the teeth by corresponding veins, which usually follow the course of the arteries, and terminate in the internal maxillary vein—a branch of the external jugular.

CIRCULATION IN THE TEETH.

It has been much disputed whether the blood actually circulates within the substance of the teeth, as in the other osseous parts of the body. Almost all of those whose attention has been especially directed to the study of the teeth, believe that it does, while some of the most distinguished physiologists and anatomists of modern times affirm that the teeth are totally devoid of a circulation.

John Hunter was the first who questioned the vascularity of the teeth, in consequence of the result of some highly ingenious experiments which he instituted for the purpose of ascertaining the fact. The following are the grounds upon which he formed his opinion of their non-vascularity; but it will be observed that this was by no means so decided as is generally supposed.

“We cannot by injection prove that the bony part of a tooth is vascular; but, from some circumstances, it would appear that it is so; for the fangs of the teeth are liable to swellings, seemingly of the spina ventosa kind, like other bones; and they sometimes ankylose with the socket by bony and inflexible continuity, as all other contiguous bones are apt to do. But there may be a deception here, for the swelling may be an original formation, and the ankylosis may be from the pulp that the tooth is formed upon being united with the socket. The following considerations would seem to show that the teeth are not vascular: First, I never saw them injected in any preparation, nor could I ever succeed in any attempt to inject them, either in young or old subjects; and therefore believe that there must have been some fallacy in the cases where they have been said to be injected. Secondly, we are not able to trace any vessels going from the pulp into the substance of the new formed tooth; and whatever part of a tooth is formed, it is always completely formed, which is not the case with other bones. But what is a more convincing proof, is reasoning from the analogy between them and other bones, when the animal is

fed with madder. Take a young animal, viz. a pig, and feed it with madder for three or four weeks; then kill the animal, and upon examination you will find the following appearance: First, if this animal had some parts of its teeth formed before the feeding with madder, these parts will be known by their remaining of the natural color; but such parts of the teeth as were formed while the animal was taking the madder will be found to be of a red color. This shows that it is only those parts that were forming while the animal was taking the madder that are dyed; for what was already formed will not be in the least tinged. This is different in all other bones; for we know that any part of a bone which is already formed is capable of being dyed with madder, though not so fast as the part that is forming: therefore, as we know that all bones, when formed, are vascular, and are thence susceptible of the dye, we may readily suppose that the teeth are not vascular, because they are not susceptible of it after being once formed. But we shall carry this still farther: if you feed a pig with madder for some time, and then leave it off for a considerable time before you kill the animal, you will find the above appearances still subsisting, with this addition, that all the parts of the teeth which were formed, after leaving off feeding with the madder, will be white. Here, then, in some teeth, we shall have white, then red, and then white again; and so we shall have the white and the red color alternately throughout the whole teeth.

"This experiment shows that the tooth, once tinged, does not lose its color. Now, as all other bones that have been once tinged lose their color in time, when the animal leaves off feeding with madder, (though very slowly,) and as that dye must be taken into the constitution by absorbents, it would seem that the teeth are without absorbents, as well as other vessels.

"Another circumstance in which teeth seem different from bone, and a strong circumstance in support of their having no circulation in them, is, that they never change by age, and seem never to undergo any alteration, when completely formed, but by abrasion; they do not grow softer, like other bones, as we find in some cases, where the whole earthy matter of the bones has been taken into the constitution.

"From these experiments it would appear that the teeth are to be considered as extraneous bodies, with respect to a circulation through their substance; but they have most certainly a living principle, by which means they make a part of the body, and are capable of uniting with any part of a living body."

I have quoted from Hunter's Treatise, thus at length, for the purpose of giving a detailed view of a question that has been much misunderstood. It will be observed, that his opinion of the non-vascularity of the teeth was by no means decisive; and that,

at the outset, he even appears to have entertained an idea of their being possessed of a circulation. The arguments which he adduces in support of his theory are far from conclusive, and the majority of them might even serve for its refutation. For example, he says, that "the first consideration which leads him to suppose that the teeth are not vascular is, that they have never been injected, and that no blood vessels are seen to enter their structure." Now, this may arise, either from the materials which are commonly used for injecting the arteries, not being sufficiently fine to enter the minute vessels of the teeth; or from the circumstance that many of the arteries are so small as, in their ordinary condition, not even to admit the highly attenuated red particles of the blood, although they may do so on being distended during inflammation. This is every day seen in the instance of inflammation of the conjunctival membrane of the eye; the vessels of which, in their healthy state, are too diminutive to admit the red particles of the blood, though they readily do so on inflammatory distension, when the eye becomes what is termed blood-shot. And it is equally probable that if the unyielding osseous structure of the teeth did not prevent the dilatation of the vessels within it, we should also frequently find them charged with blood.

The experiment made on the animal is also inconclusive, as the madder may not have been administered for a period sufficiently long to have imparted a color to the portion of the tooth which had already been formed; although, from its presence in the blood, it may have tinged that part which was in the act of formation. Besides, even if it never did color the osseous substance of the teeth, it is not a proof that vessels do not exist in that structure. On the contrary, it may well be supposed, that those vessels which are usually impervious to the highly attenuated red particles of the blood, will naturally exclude any artificial coloring matter.

But the most extraordinary of all Hunter's arguments against the vascularity of the teeth, is his remark, that "it would seem that the teeth are without absorbents, as well as other vessels." Coming from such a quarter, this assertion will almost appear to be incredible; as Hunter was well aware, that not only are the roots of the temporary teeth removed by the absorbents, but also that the effects of these vessels are frequently evident upon the permanent teeth.

The opinion which Hunter retained of the non-vascularity of the teeth, is now almost universally considered to be erroneous; and all the best authors who, since his time have written on this subject, believe that the teeth are possessed of organization,

although perhaps not of so high an order as the other parts of the osseous structure.*

Many conclusive arguments might be adduced, to corroborate the soundness of this opinion; but these are altogether unnecessary, as it is substantiated by actual observation. On extracting, and immediately afterwards cutting across a tooth, which has been in a state of high inflammation previous to its removal, small specks of blood will not unfrequently be discovered in its osseous structure, if it be examined with the microscope. These small vessels are sometimes still more strikingly apparent in cases where the teeth have been accidentally fractured.

I recently witnessed a case of a boy about twelve years of age, two of whose teeth had been broken over at their necks, by the blow of a cricket ball. The vessels in the canals not only bled freely, but several small red spots were distinctly seen on the osseous surface of the fracture; and these repeatedly re-appeared after being effaced by a sponge.†

* From this remark, of course, many eminent writers on general physiology are excepted. I have already stated, that the majority of physiologists who have lived since the days of Hunter, aware of his profound research and accuracy on almost every subject, have generally followed his views, and denied the vascularity of the teeth. Mr. Lawrence, in his translation of "Blumenbach's Comparative Anatomy," has the following passage, which Mr. Bell calls "extraordinary," and well may do so. "The vascularity of the teeth," Lawrence says, "is a doctrine refuted by every circumstance in the formation, structure, and diseases of these organs."

I regret that on this point I have not the support of the distinguished lecturer, to whom I am indebted for whatever little anatomical knowledge I possess. Dr. Knox, an anatomist and physiologist of our own, not inferior to Lawrence, or to any of the age, I believe, retains the same opinion of the non-vascularity of the teeth. But it may well be supposed, that the deep attention which these gentlemen have bestowed on other parts of the system, more interesting to them, in a physiological point of view, than the teeth, may have prevented their observation being so minute as that of those whose avocations lead them almost exclusively to the study of these organs.

† Mr. Bell states, that he has made similar observations on cutting across teeth, shortly after their extraction. He also mentions an instance in which the teeth were completely tinged with a yellow color, in a person who had suffered from jaundice; and remarks, that "in those whose death has been occasioned by hanging or by drowning, I have invariably found the whole of the osseous part colored with a deep dull red, which could not possibly have been the case if these structures were devoid of a vascular system. In both instances, the enamel remains wholly free from discoloration."

The extraordinary case which the same gentleman details of finding a cavity filled with pus, in the interior of the osseous substance of a tooth, is, if possible, still more conclusive; it being, I believe, universally admitted, that pus cannot be deposited, except through the medium of the arteries.

ABSORBENTS OF THE TEETH.

The absorbent vessels of the teeth are far more minute than those which convey their blood; indeed, I am not aware that they have ever been traced by the most patient anatomist. No doubt, however, can well be entertained of their existence, as their effects are every day strikingly apparent in the removal of the roots of the temporary teeth; and in the absorption of the sockets, and frequently also of the fangs, of the permanent set. From these circumstances, it would seem that the dental absorbents either exist in, or are intimately connected with, the membrane which surrounds the roots of the teeth and is thence reflected upon the interior of their sockets.

These vessels, small as they are, are in a state of perpetual activity, and eventually predominate over every other structure of the body; for absorption—that singular preparation made by nature for renewing the system, as well as insuring its ultimate decay—is always going on, although it is not until the meridian of life has been passed, that the arteries naturally cease to deposit new matter more rapidly than the absorbents remove the old.

NERVES OF THE TEETH.

The nerves that are distributed to the teeth are branches of the fifth pair, of whose course it will be necessary to give a brief outline, for the purpose of explaining the source of the sympathy which exists between the teeth and other parts of the body, especially the head and face, to which this important nerve is the chief source of sensation. For a more minute description of the nerve itself, and the important functions it performs, I must beg to refer to the enlightened writings of Sir Charles Bell, whose highly original view of the nerves has excited the admiration of the present age, and will doubtless be considered by posterity as amongst the most splendid theories which any physiologist, of any era, has ever proposed to the world.

The fifth pair of nerves, on emerging from the brain, divides into three important branches:

- 1st, The ophthalmic nerve.
- 2d, The superior maxillary nerve.
- 3d, The inferior maxillary nerve.

The ophthalmic nerve, passing into the orbit, is subdivided into three or four branches.

1st, The orbitary, which, after giving off several small branches to the muscles of the eye, the eye-lids, and the lining membrane of the frontal sinus, passes through the supra-orbitary foramen, and is distributed on the frontal muscles and integuments of the forehead and temples, where it communicates freely with the branches of the portio dura of the seventh pair of nerves.

2d, The nasal nerve, which is chiefly distributed on the pituitary membrane of the nostrils, to which it is believed to communicate sensation, the olfactory nerves being supposed merely to indicate the sense of smelling.

The nasal nerve also distributes several small branches to the lachrymal sac, caruncula lachrymalis, &c., and a very minute but important twig, which, uniting with a small branch from the third pair of nerves, forms the lenticular ganglion, from which the delicate ciliary nerves arise.

The branches of the nasal nerve anastomose freely with those of the superior maxillary.

3d, The lachrymal nerve, which is principally distributed on the lachrymal gland, and the parts concerned in the production of the tears. This division of the orbital nerve also gives off several small branches, which are distributed on the membranes of the eye, &c., and others that communicate freely with the branches of the superior maxillary.

THE SUPERIOR MAXILLARY NERVE.

The superior maxillary nerve, on entering the orbit, gives off several small and unimportant twigs, which are distributed on the adjoining parts; and, before passing into the infra-orbital canal, gives off the following branches:—

1st, The vidian nerve, which forms the chief channel of communication between the nerves of the head and the great sympathetic nerve.

2d, The palatine nerve, the branches of which are distributed on the uvula, the soft parts of the palate, the gums, and the lining membrane of the mouth.

3d, The alveolar branch, which, after giving off several small branches to the muscular part of the cheek, and the lining membrane of the mouth, enters the maxillary antrum by several small openings in the posterior tuberosity of the bone, and ramifies on the lining membrane of that cavity. Small twigs of the nerve, dipping through the membrane and the osseous floor of the antrum, are distributed to the molares, and the adjacent small grinders of the upper jaw.

The upper incisors and canine teeth, with the first small grinder, receive their nerves from small branches, which the superior maxillary nerve gives off, in the course of its passage through the infra-orbital canal.

The trunk of the superior maxillary nerve now enters the canal already mentioned, and emerging from it about half an inch below the inferior ridge of the orbit, is ultimately distributed on the muscles and integuments of the face; its branches communicating freely with those of the other divisions of the nerve, and the portio dura of the seventh pair.

It is this branch of the superior maxillary nerve which is subject to that mysterious disease, known by the name of *tic douloureux*. The intricate communication of its branches with many of the nerves of the head, and its direct anastomosis with almost all those of the face, will explain the cause of the violent suffering which is invariably experienced in these parts, when the trunk of the nerve is attacked by this peculiar irritation.

INFERIOR MAXILLARY NERVE.

The inferior maxillary nerve, the third and largest division of the fifth pair, passing out from the skull by the foramen ovale, holds a deep seated course. After distributing several unimportant branches to the adjoining parts, it divides into two highly important nerves.

1st, The gustatory nerve, which is distributed on the surface of the tongue, and believed to impart to it the sense of taste; the branches of the ninth pair of nerves, or *linguales*, ramifying chiefly on the muscular part of the organ, and supposed only to communicate to it the power of motion.

From the gustatory nerve is given off a very delicate but important branch, the *chorda tympani*, which, uniting with a branch of the *portio dura* of the seventh pair, establishes a direct communication between the inferior maxillary nerve and the internal ear.

2d. The proper maxillary nerve, which, entering the inferior maxillary bone by its posterior foramen, extends along the canal that exists in the centre of the bone. In its course it gives off branches to each of the teeth in succession, and afterwards emerging by the anterior foramen, is ultimately distributed on the muscles and integuments of the lips, chin, and upper part of the neck.

These branches communicate freely with those of the superior maxillary and other nerves of the face, and also with the ramifications of the cervical nerves.

The three inferior molares and adjoining small grinder, are supplied by twigs which the nerve gives off in its course through the maxillary canal; and the first small grinder, with the canines and incisors, receive their nerves from a branch which the trunk of the nerve sends forward, before leaving the bone by the anterior foramen.

SYMPATHY BETWEEN THE TEETH AND THE OTHER PARTS.

From the above outline of the course of the fifth pair of nerves, and of their extensive and intricate connection with almost all those of the face and head, it will be evident from what source the sympathy arises which is so often exhibited by these when the teeth are affected by disease. Thus, when the nerve of a tooth is in a state of irritation, the pain is rarely confined to the seat of the disease; but is usually extended to the face, and the head in general, giving rise to painful swelling of the cheeks, suffusion of the eyes, headache, and frequently to severe inflammation of the internal ear. Earache, indeed, will often be found to arise solely from the presence of a carious tooth, in which perhaps there is very little pain. Hence, when there is any irritation of that delicate organ, it is well to make a careful examination of the mouth, and if any tooth, which from its situation is likely to be the cause of the auricular pain, is observed to be carious, its removal should be effected, and the operation will generally afford relief to the ear.

The pain arising from inflammation of the adjoining parts is, on the other hand, occasionally communicated to the teeth. This is especially observed in cases of *tic douloureux*, which was at one time supposed to arise from irritation of the dental nerves. The teeth were often, on this supposition, extracted one after another, though perfectly healthy and sound, until the whole of them had been removed, without affording any permanent relief. The dreadful suffering experienced by the victims of this disease, is now known to arise from a peculiar affection of that large branch of the nerve which is distributed to the muscles of the face, the infra-orbitary. From this trunk, it has been already stated, the superior dental nerves arise; and hence the pain is thus extended to the teeth, although they are only secondarily affected.*

* These remarks will also show how imperatively necessary it is that every dentist who desires to practise his profession with advantage to his patients and honor to himself, should have a regular surgical education.

"That ignorance and quackery," Mr. Bell observes, "have usurped as high a seat, and exercised as sovereign a sway in this as in any other department, is a truth against which, with the examples surrounding us on every side, it is impossible to close our eyes."

I regret to be obliged to add that this is but too much the case, and that a great majority of those who style themselves "Surgeon Dentists," consist of persons who have originally followed avocations widely different. It is scarcely to be supposed that their former pursuits could have contributed much to their scientific or surgical knowledge; and yet such persons, daily, through the medium of the public prints, push themselves into notice, with an assurance that is only to be equalled by the daring rashness which they evince in what they term "Dental operations carefully performed;" but which can only be designated as the barbarous and ignorant malpractices of quackery.

CHAPTER V.

CLASSIFICATION OF THE TEETH, AND GENERAL DESCRIPTION OF THE RESPECTIVE CLASSES.

Of the Incisors—Canines, or Eye Teeth—Bicuspides, or small Grinders—and Molares, or large Grinders.

THE teeth are divided into four classes, namely, incisors, canines or eye teeth, bicuspides or small grinders, and molares or large grinders. The whole of these classes exist both in the temporary and permanent sets, with the exception of the bicuspides, which are only to be found in the second set of teeth. To the permanent set the following description will be chiefly directed, as their classification is not only much more complete, but the teeth themselves are more strikingly marked, and of greater importance than those of the temporary set.

These different classes of the teeth are arranged in the mouth in the order in which they have been named,—the incisors occupying the anterior part, and the molares the posterior extremities of the maxillary bones; and both differing as widely from each other in form and appearance as they do in their respective situations. The canines and bicuspides are placed between them, and present an aspect intermediate to both. The different classes of the teeth thus exhibit a regular gradation, from the gracefully formed and sharp edged incisor, to the large and rhomboidal figure of the grinding teeth.

OF THE INCISORS.

The incisors are eight in number, four of them being situated in the front part of each maxillary bone. The two anterior teeth receive the name of central incisors, from being placed on each side of the mesial line of the face; an imaginary line parallel with the frænum of the lips, or the division of the nostrils, and considered as the centre of the mouth.

The other two incisors are termed laterals, from their position by the side of the centre teeth; on the outer edge of each of which a lateral incisor is placed.

The centre incisors of the upper jaw are the largest of any of this class of teeth; and are considerably more so than the adjoining laterals. In the under jaw the reverse of this occurs, the centre teeth being there somewhat less than the lateral ones, and the whole of them considerably smaller than those of the upper jaw.

All of the permanent incisors are of a much greater size than the corresponding teeth of the temporary set. When first formed, they are situated behind these; but in proportion as the fangs of the first set are removed by absorption, the bodies of the second advance forwards, and if they perforate the gums in a regular direction, they ultimately occupy a position considerably more prominent.

The whole of the incisors are single-rooted teeth. Their fangs are generally long, and of a conical shape, gradually tapering to the extremity. Those of the laterals of the upper jaw are frequently bent, or have a hook-like termination, and are somewhat flattened, or perhaps hollowed on their sides, while the central ones are nearly round. The under incisors, again, are all more or less flattened on their sides, and the laterals are considerably hollowed.

From the length of their roots, the attachment of these teeth to their sockets is strong and firm; though, like all the other single rooted teeth, they are capable of a slight degree of motion in every direction. This arises from the compression of the elastic membrane that is interposed between them and their sockets, and materially contributes to their permanency by diminishing the shock of any sudden blow which might otherwise splinter the alveolar processes, or fracture the teeth.

The bodies of the incisors, on their anterior aspect, present the appearance of a well formed oval, somewhat flattened at the sides, and always so at the edges, in the adult teeth. When the teeth first perforate the gum, their edges usually have a notched or serrated appearance, which, however, is soon removed by their contact with each other; and they ultimately become nearly level and flat. That edge of the tooth which is nearest to the centre of the mouth is generally more pointed than the lateral one; and this feature, in union with the more prominent development of the teeth on the central aspect, will always serve to distinguish an incisor of the right side of the mouth from one of the left.

When looked at in a lateral direction, the incisors have a wedge-like appearance; a form which is well adapted for *cutting*, the purpose for which these teeth were intended, as their name denotes.

The enamel of the incisors is thickest and strongest on their edges, and anterior and posterior surfaces, where they are most exposed to be worn down by friction. On their sides it is much thinner, as they are there almost completely beyond the reach of that influence, by being placed in contact with each other: although it is here where they generally first give way, caries very frequently commencing on the sides of these teeth, in consequence

of the enamel being crushed by their pressure on each other. To this disease, however, the incisors are among the least liable of any of the teeth, and especially those in the under jaw.

The use of the incisors is, to divide substances previous to their being comminuted by the larger teeth. They also greatly contribute to the distinctness of articulation, which is always much impaired when any of these teeth have been lost.

The temporary incisors usually perforate the gums between the fifth and tenth months; the permanent ones from the sixth to the eleventh year.

OF THE CANINE, OR EYE TEETH.

The cuspidati, or canines, are four in number. They are placed next to the incisors, one on the outer side of each lateral; and are intermediate in their general appearance, as well as in position, between these and the bicuspidates. They are the largest of any of the single-rooted teeth, and generally the strongest and most prominent of the set.

These teeth have received the name of canine from corresponding to those that are so strikingly developed in the dog, and other carnivorous animals, and are used for the same purpose as these, namely, seizing and tearing asunder substances prior to their comminution by the grinding teeth.

They are popularly termed eye teeth, from a mysterious connection that has been supposed to exist between them and the organ of sight. This opinion, like many others of a similar nature, is unquestionably erroneous, as no communication can be traced between the two. In the under jaw, their position renders it impossible that they can have any nearer connection with the eye than the adjoining teeth have; and if that organ is occasionally affected by the extraction of a canine of the upper jaw, it must be owing to the great length of their roots, which approach nearer to the orbit than those of any of the other teeth.

The canines have generally only one root, though in the under ones the rudiments of two may be occasionally observed. Their fangs are always the largest of those of any of the teeth, and are generally considerably flattened, or hollowed, on their sides. The root is seldom straight, and frequently has a hook-like extremity. From these circumstances, and their great length, they have a very firm attachment to their sockets, and generally remain longer in the mouth than any of the other teeth.

The bodies of the canines are exceedingly strong. Their edges are more rounded than those of the incisor teeth, and usually terminate in a sharp prominent point, a feature which they almost invariably retain to the last. On their posterior aspects, especially in those of the upper jaw, another smaller prominence will gene-

rally be seen, indicating an approach to the formation of the grinding surface.

The enamel of the canines is of great thickness on their points, and on their anterior and posterior surfaces. It frequently has the serrated appearance on its edge, or may exhibit two or more distinct points here, when the teeth perforate the gums.

The canines are less liable to become diseased than any of the other teeth; and, on the whole, may be considered as the most perfectly formed and important of the set; as, from their great strength, they are more frequently used than any of the others; and by their prominent position, they materially contribute to preserve the natural shape of the jaws, which always undergo a considerable contraction when these teeth have been removed.

The temporary canines usually appear between the fourteenth and twenty-first months: and the corresponding permanent ones between twelve and fourteen years of age.

OF THE BICUSPIDES.

The bicuspidés, or small grinding teeth, are eight in number; four of which are placed in each jaw, between the canines and the molares. They are intermediate between these teeth in their functions and general appearance, as well as position.

They have received the name of bicuspidés, or bicuspidati, from having two distinct points on their crowns. These prominences are seen on their anterior and posterior edges, and are most strikingly marked in the teeth of the upper jaw, where both are nearly equally prominent. In the under jaw, these points are not so equally large; the anterior one being prominent and well marked, while the posterior one is much smaller, and situated considerably lower down. Between the prominences there are, of course, correspondidg depressions; and the whole are so formed, that, when the teeth approximate, the anterior points of the under bicuspidés enter into the sinuosities between those of the upper; and the posterior prominences of the upper teeth enter into the depressions of the under, while their anterior edges overlap these teeth in front. The crowns of the opposite teeth are thus in close contact when the jaws approximate, and although they are well protected by a thick enamel, they often become completely flat and smooth by the continued friction,

The bicuspidés have usually only one root, although they often have the appearance of two, or sometimes of three united. Occasionally, however, the first small grinder of the upper jaw has two distinct fangs, which is sometimes, though more rarely, observed in the corresponding under tooth.

It has been already stated, that this class of teeth is peculiar to the permanent set, and that they do not exist in that of the child.

During their formation, their bodies are situated between the diverging fangs of the temporary molares, whose places, on penetrating the gums, they occupy; and, from being of a smaller size than these, they afford more space in the jaws for the larger permanent incisors and canines.

The bicuspidés usually make their appearance between the thirteenth and fifteenth years of age.

OF THE MOLARES, OR LARGE GRINDERS.

The molares are twelve in all, three being arranged on the right and left sides of each jaw. The posterior of the three is termed the *dens sapientiæ*, or wisdom tooth, from being considerably later in appearing than any of the others.

The bodies of the molares are much larger than those of any of the set, and are surrounded by a thick layer of enamel, which is especially abundant on the crowns of the teeth. The crowns are also marked by many prominent points and depressions, by means of which the substances, which are submitted to their action, are more easily comminuted. The prominences of the under jaw usually correspond to the depressions in the upper, and *vice versa*.

These inequalities on the crowns are most conspicuous when the teeth first perforate the gums. As the individual advances to age, they become gradually effaced by the perpetual friction; and in old persons, especially in those who have subsisted on hard substances, such as biscuits, &c. the surfaces of the teeth are generally completely smooth.

These depressions on the crowns of the molares, although they contribute greatly towards facilitating mastication, yet render these teeth more liable to become carious than any of the others; particles of the food being readily entangled by them, and when allowed to remain, undergoing decomposition on the crowns, where caries is most frequently observed to commence.

The molares are firmly attached to their sockets by a number of strong diverging roots. In the upper jaw, the two first teeth always have three distinct fangs; two of which are placed on their outer, and one on the inner side. The corresponding under teeth have usually only two roots, and these do not diverge so much from each other.

The wisdom teeth have generally only one fang, especially in the upper jaw, though this often presents the appearance of several united.

Considerable variety, however, exists in the number of the roots of the whole of these teeth, and cases of four or even five distinct fangs may occur.

The molares of the child are only eight in number; the first

one usually appears between the tenth and twelfth months, and the second about the end of the third year, when the temporary set of teeth is completed.

The first of the permanent large grinders generally perforates the gum about the end of the fifth year; the second about the age of fourteen; and the wisdom teeth rarely until eighteen or twenty years of age. They are often much later in appearing, and cases are on record in which they have not advanced until the fiftieth or sixtieth years; and others, in which they never came forward at all.

CHAPTER VI.

OF THE TEMPORARY AND PERMANENT SETS.

Of the Temporary Teeth—Period of their Appearance, and order in which they advance—General Description of them—Shedding of the Teeth—Preparations of Nature for it—of the Permanent Set—Order in which they Appear—their position in the Maxillary Bones—Appearance of these when the Teeth are completed—of Supernumerary Teeth—Impossibility of the existence of a third set.

THE temporary set of teeth are twenty in number; consisting of four incisors, two canines, and four molares in each jaw.

The formation of these commences as early as the fourth month of the foetal existence, and the whole of them are developed in the maxillary bones at the period of birth; although they do not, in general, make their appearance externally until several months afterwards.

The teeth are usually first seen when the child is between six and seven months old. Frequently, however, they appear as early as the fourth month; and on other occasions, a whole year after birth may have elapsed, before any of them have perforated the gums. It is generally observed, that a healthy child obtains its teeth at an earlier period than a delicate one; although this is not invariably the case.*

* "The absolute absence of teeth for the first six or seven months, clearly points out the impropriety of introducing any solid food during that period; and by those who take nature for their guide, will be deemed sufficient to induce them to restrict infants to that food which has been so bountifully provided for them, and for which alone the delicate state of the digestive organs is at first adapted."—Bell on the Teeth.

ORDER IN WHICH THE TEMPORARY TEETH APPEAR.

The under teeth almost always perforate the gums before the upper ones; and in both jaws they advance in pairs, one tooth appearing on the right or left side of the centre line, and either accompanied, or in the course of a few days followed, by the corresponding one of the opposite side.

A central incisor of the under jaw is generally the first tooth that is obtained. It is usually observed about the sixth or seventh month, and is immediately afterwards followed by its fellow. The corresponding teeth in the upper jaw make their appearance in the same manner, in the course of a few weeks.

The under lateral incisors next advance, about the eighth or ninth month; and are soon afterwards followed by the corresponding upper ones. The whole of the incisors are thus usually seen when the child is nine or ten months old.

The canine teeth, which in arrangement are situated next to the incisors, are so much more deeply placed in the maxillary bones, that they seldom make their appearance until the fifteenth or sixteenth month; and are preceded by the first grinding tooth, which is usually present on both sides, above and below, when the child is one year old.

The second temporary grinding teeth are considerably later in appearing, and seldom perforate the gums until the end of the second or beginning of the third year. When these teeth are obtained, the temporary set is completed.

REMARKS ON THE TEMPORARY TEETH.

The temporary set of teeth do not differ materially from the permanent in their structure and general appearance. They are, however, much smaller, and more delicately formed; and, as their name implies, are not nearly so durable. They remain but a few years at the utmost, and often begin to decay almost as soon as they perforate the gums.

The pain which this premature caries gives rise to, is rarely so acute as it is in that of the permanent set, although it may sometimes be so severe as to render the extraction of them imperatively necessary. But it should be the object of the dentist to postpone the operation as long as possible, as the preservation of these teeth is essential not only to the health of the child, but also to the proper formation and regular position of those that are to succeed them.

About the fifth or sixth year of age, the roots of these teeth are removed by absorption; the dental absorbent vessels being stimulated either by the pressure, or by the advance, of the bodies of the permanent teeth. When the fangs are thus removed, the teeth,

being deprived of their support, become loose, and eventually drop out. When this occurs, their necks have sometimes a splintered appearance, as if the teeth had been broken across; although in general the removal of the fangs is so completely effected by absorption, as to give rise to the popular but erroneous opinion that the temporary teeth have no roots.

Occasionally, however, the fangs of several of these teeth seem to escape the action of the absorbents, and these may then remain firm in their sockets for many years. This occurrence will, of course, prevent the corresponding teeth of the permanent set from advancing at the proper period; although they may afterwards appear when the temporary ones have been removed in the course of time in the usual manner.

I have no doubt that it is invariably from this occurrence that those anomalies of the appearance of new teeth at an advanced period of life proceed, which are erroneously considered as part of a third set. As an instance of this, I may mention the following case:

About a year ago, I met with a gentleman, upwards of forty years of age, who still retained some of the temporary incisors of the lower jaw, and the canines of the upper. One of the latter required to be removed on account of the pain which carries of it gave rise to; and its root was found to be quite entire and sound. I persuaded the gentleman, contrary to his own inclination, to have no artificial tooth put in its place; and the advice has been justified by the event, as he has recently informed me that a new tooth is now making its way through the gum.

SHEDDING OF THE TEETH.

The first set of teeth are, from the delicacy of their structure, evidently designed solely for the earlier years of childhood, and are soon to be replaced by others more adapted for the purposes of maturer age. The period at which this interesting change occurs, ought always to be regarded with much attention by those to whose care the child is intrusted, as the perfection of the speech, the beauty of the lower part of the countenance, and, to a certain extent, health in general, are in a great measure dependant on its successful completion.

There is perhaps no occasion in which the hand of nature is so strikingly displayed in the animal economy, as in the provident preparations which are made for substituting the large and durable permanent teeth, for the small and delicate temporary set. At a considerable period before that at which the permanent teeth are destined to appear, the maxillary bones may be observed to be gradually increasing in size, and becoming much altered in form. The temporary teeth, which had formerly been close,

now separate from each other; and the maxillary bones, which had hitherto been of a semi-circular figure, whose breadth was greater than its length, now become more elongated, and assume the appearance of an elliptical arch or semi-oval, the diameter of which is greatest from its anterior to its posterior extremities. The under jaw, which had always been wider than the upper, now also begins to project beyond it in front, giving rise to that prominence of the chin, and lengthening of the face, which mark the transition from childhood to a more advanced period of youth.

The first external appearance of the shedding of the teeth, is usually observed about the sixth or seventh year of age, although the period is subject to considerable variation. The process, however, had been going on for a long time before, as the rudiments of several of the permanent teeth were present within the jaws at birth; and the formation of the others advances with that of the temporary teeth, until the fifth or sixth year, when the bodies of all the permanent set, excepting the wisdom teeth, are developed in the maxillary bones, and the temporary ones are about to leave them.

The head of a child of this age will afford a remarkable appearance, as forty-eight teeth (twenty temporary, and twenty-eight permanent) are then present in the jaws, if none of the first set have been removed.

To those who have not examined the subject, it will appear almost incredible, that the small size of the maxillary bones at this period could afford the space requisite for so many teeth; nor indeed would it be possible for them to contain the half of the number, were it not for the peculiar and provident mode in which they are arranged.

At this early age, the bodies of the maxillary bones are little more than a series of shells, in consequence of the number of the sockets of the teeth. The permanent incisors are then situated behind the corresponding temporary ones; the canines and small grinders deeply under the orbit; the bodies of the latter generally lying within the space that is formed by the diverging of the roots of the temporary molares; while the first and second permanent molares occupy that space which the maxillary bones acquire by their increased elongation.

In proportion as the bodies of the permanent teeth advance towards the surface, the fangs of the temporary ones are removed by the absorbent vessels, stimulated probably by the pressure. But the permanent teeth do not occupy the sockets of the temporary ones, as is generally believed; for those of the latter are gradually removed in proportion as the absorption of the roots goes on, and new sockets, as well as new teeth, are created to succeed them.

The temporary teeth generally drop out in nearly the same order in which they advanced, and are quickly succeeded by the permanent set.

OF THE PERMANENT SET OF TEETH.

The permanent set of teeth are thirty-two in number; there being in each jaw four incisors, two canines, four bicuspides, and six molares. The mode in which they are formed has been already generally described; and I have now chiefly to notice the singular connection which subsists betwixt them and the temporary set.

The second set of teeth may be considered as the offspring of the first; for shortly after the appearance of the pulp which constitutes the germ of the temporary tooth, a small process, consisting of portions of the rudimentary body and its investing membranes, shoots out from it; which, at first even more delicate than the trunk from which it sprung, and entirely dependant on it for support, eventually becomes the dense and strong permanent tooth.

These rudiments of the permanent teeth are at first contained in the same cells with the temporary pulps; but are eventually placed in distinct sockets of their own, formed by absorption in the interior of the maxillary bones. A communication, however, still subsists between them, by means of the *cervix* of the original process; which becoming gradually elongated, remains attached by one extremity to the sac containing the rudiments of the permanent, and by the other to the neck of the temporary, tooth and the gum surrounding it. It is from the latter source that the vessels of the vascular membrane, which then surrounds the rudimentary pulp, proceed, and afford nutrition to the capsule and its enclosure.

This singular communication between the two sets of teeth may be traced as late as the third or fourth year of age, and there is reason to suppose that it exists almost until the period at which the first set of teeth is ready to give place to the second. It will prove what injurious consequences to the permanent teeth may result from the barbarous, empirical practice of prematurely removing the temporary ones, for the pretended purpose of preventing irregularities of the second set.

ORDER IN WHICH THE PERMANENT TEETH APPEAR.

The permanent teeth occupy a period of at least eighteen years for their completion—several of them being present at birth, and the last of them, the *dentes sapientiæ*, not appearing until the adult age.

The first teeth of the second set that perforate the gums are usually the anterior molares. These may generally be observed, in both jaws, about the end of the fifth year, before any of the temporary teeth have been shed; and they usually come in so easily, that it frequently happens that neither the child nor its attendant is aware of their existence.

The two central incisors of the under jaw next appear—the one generally preceding the other by a few days. They are shortly afterwards followed by the corresponding upper teeth, which are usually present between seven and eight years of age.

The lateral incisors, below and above, come forward, in the same order, in less than a year afterwards.

The anterior bicuspidés are generally the next teeth that advance. They usually appear about the eleventh year, and precede the posterior ones by nearly twelve months.

The canines, from the deep situation they occupy, the upper ones being placed immediately under the orbit, and the under near the base of the jaw, are seldom seen until twelve years of age. They are generally accompanied by the second bicuspidés.

The second molares are observed about the end of the thirteenth year; and for the present complete the permanent set.

The posterior molares, or wisdom teeth, do not perforate the gums until the nineteenth or twentieth year. The period of their appearance is very irregular. They are often much later in advancing; and cases are known in which they have not appeared until the fiftieth or sixtieth year, and others in which they never came forward at all.

RELATIVE POSITION OF THE PERMANENT TEETH TO THE MAXILLARY BONES.

At the time that the permanent set of teeth are completed, the maxillary bones will also be found to be fully formed. The increased depth of the under jaw, and its prominence in every direction, but especially in front, over the upper, will now be observed. These give rise to that projection of the chin, and lengthened or oval appearance of the face, which are almost always observed in the adult person.

But this great prominence of the under jaw would interfere with the performance of mastication, and produce deformity, were it not counteracted by the relative position of the teeth. These, in the lower jaw, have a considerable inclination inwards, and fall within the line of the upper ones, which project in the opposite direction, and overlap them in front, while, posteriorly, the teeth meet in nearly a parallel line when the jaws approximate.

This arrangement of the under teeth within the circle of the upper, is always observed in a well formed mouth, and is neces-

sary, not only for the symmetry of the face, but also for the preservation of the teeth. For if the reverse occurs, and the under teeth project beyond the upper, considerable deformity of the countenance is generally observed; and if the opposite teeth meet each other exactly in a line, they are always rapidly worn down.

OF SUPERNUMERARY TEETH.

Before closing the description of the permanent teeth, it will be necessary to notice a class of supernumerary ones which occasionally appear along with them.

These teeth, like other similar structures, arise from accidental formation, and will be always readily distinguished by their imperfect appearance, which somewhat resembles that of an ill formed lateral incisor of the upper jaw, or one of the inferior bicuspides. The position which they occupy is as irregular as their appearance, as they are sometimes seen between the upper incisors, or placed behind them. In other cases, they are situated at the posterior part of the jaw, and occasionally in the roof of the mouth. They are invariably productive of great deformity and inconvenience, and should be removed as soon as they are discovered.

IMPOSSIBILITY OF THE EXISTENCE OF A THIRD SET.

Before concluding this part of the work, it may be well to allude to the supposed existence of a *third* set of teeth, of which we frequently hear, and even find some persons sufficiently credulous to believe in. Doubtless there are several well authenticated cases of teeth coming forward at an advanced period of life; but these are no new formation, but merely part of the second set, whose progress may have been for a time retarded by the non-absorption of the roots of the temporary teeth, or some similar obstacle, although they may afterwards make their appearance when these have been removed. This appears to be the only way of accounting for their occasional occurrence; for the idea of the existence and advance of a third set of teeth after the second have been removed, is so diametrically opposed to every principle of physiology, that I shall not believe in it, until it is substantially proved that the head will again spring from the shoulders after the individual has undergone the ordeal of the guillotine.

PART II.

THE IRREGULARITIES AND DISEASES OF THE TEETH, &c.

CHAPTER I.

OF IRREGULARITIES OF THE TEETH AND THEIR TREATMENT.

IN a former chapter, it was mentioned that, in a well-formed mouth, the teeth presented the appearance of a graceful semi-elliptical arch; and that the under ones were overlapped by the upper in front. They do not, however, always perforate the gums in this regular order: the smallness of the maxillary bones at the time the second set come in, the great size of the permanent teeth, compared with those which preceded them, and the situation of part of them on the inner, and of others on the outer, side of the temporary ones, before they advance to the surface—all tend to prevent their assuming a regular position.

In describing those irregularities which most frequently occur, I shall mention the mode of treatment peculiar to each; but a few preliminary observations will be necessary on the principles which ought in general to direct it.

As irregularity of the teeth almost always arises from the resistance which they meet with in their progress to their position, it can only be obviated by the removal of this, or by counter pressure. The mode of treatment adopted for this purpose will prove the difference between the practice of the scientific and honorable practitioner, and the ignorant and unprincipled charlatan.

As the resistance is generally occasioned by the temporary teeth, the empiric almost invariably resorts to the premature removal of these, for the purpose, as he says, of preventing irregularity. With this view, he will unhesitatingly recommend, and (if permitted) accomplish the extraction of the temporary teeth, a considerable time before the permanent ones are ready to succeed them.

Notwithstanding the gross ignorance and cruelty evinced in such practice, it is, I regret to state, by no means unfrequent to meet with cases where parents have been thus persuaded to allow

these barbarians to remove by violence the greater number of their children's teeth, to the torture of the unfortunate little patients, at the period of this maltreatment, and, in all probability, to their lasting injury for the future.

It is impossible to deprecate too strongly the cruelty of such a course, which will never be followed by any but the most ignorant and heartless empiric. On the contrary, it will always be the aim of the enlightened practitioner to preserve the temporary teeth as long, and to extract them as seldom, as possible; not only because it is highly desirable to avoid operating on patients of such early years, but also from the presence of these teeth being necessary for the requisite expansion of the maxillary bones, and the proper development of the permanent set.

There are many cases, however, in which it becomes imperatively necessary to extract some of the temporary teeth; as, for example, when their roots have not been removed by absorption in proportion to the advance of the bodies of the permanent, when these will appear on the inner side of the first set, and thus exhibit the appearance of two rows of teeth; or they may come in with their sides directed forwards from want of the requisite space. Such irregularities can never be corrected unless the temporary teeth are extracted, although the operation ought to be considered as only the lesser evil of the two.

I shall now shortly detail the mode of effecting counter pressure.

The instrument by which this is accomplished is an invention of John Hunter, and is undoubtedly one of the most useful of all those which his prolific genius suggested. It has been subsequently recommended by Fox, Bell, and all the best writers on the subject, and, I believe, is adopted by every eminent practitioner. There are persons, I am aware, who pretend to have discovered better means of treating these affections; but as they have not thought proper to divulge them, their assertions may well be supposed to be unworthy of credit, and their boasted contrivances incapable of use. And yet these are the individuals who rail at the simplicity of Hunter's ideas, which is no doubt very uncongenial to their own tortuous courses.

The instrument suggested by Hunter consists merely of a curved gold or silver bar, adapted to the arch of the mouth, and the position of the teeth. It should extend from one extremity of the jaw to the other, and be fixed to the outsides of the posterior or strongest teeth, by means of ligatures attached to them, and tied, after being passed through two small openings in the bar. Another ligature being applied in the same manner to the irregular tooth, is to be firmly tied in front of the gag, and renewed every two or three days, until the tooth is brought forward, which will usually be accomplished in the course of a fortnight or three weeks, without much inconvenience to the patient.

It is usually necessary to have two small metallic plates attached to the lower edge of the bar, and afterwards bent horizontally. To each of these a small square piece of ivory is to be fixed by a screw and rivet, and interposed between the opposite grinding teeth, to whose crowns the surface of the bone ought to be made to correspond. The object of this modification of the bar is to prevent the teeth meeting when the jaws approximate; and it is invariably necessary in those cases in which the under teeth advance in front of the upper. When the latter have been brought forward beyond the counteracting influence of the former, the simple bar may be substituted, and allowed to remain attached to the teeth for a few days, until they become firm in their new position.

By means of the pressure of the bar, any of the teeth that are unduly prominent, may at the same time receive an inward inclination, although this is a description of irregularity which is infinitely more difficult to cure.

In those cases in which the sides of the teeth project in front, a somewhat different contrivance will be requisite. A small plate is to be accurately adapted to the irregular tooth, in the form of a cap. To this a bar is to be attached, and tied, at one extremity of the posterior surfaces of the teeth of one side, and by the other, to the anterior of those of the opposite—the bar being thus placed behind the teeth on one side, and in front of them on the other. A powerful lever will thus be made, and, if properly applied, it will turn round the tooth in the course of a few days.

These modifications of the bar will be found sufficient for effecting the cure of almost all the cases of irregularities that are usually met with. Particular instances, however, may occur in which it may be necessary to construct gags of a somewhat different form, which the dentist will readily be enabled to suggest, if he possess but ordinary dexterity.

But great as the benefit is which may be derived from the bar, I do not feel inclined, in every case, to trust exclusively to the use of it, or believe that it will always supersede the necessity of extraction. There are instances in which, as I have already mentioned, the operation becomes imperatively requisite. Of these the practitioner must judge, and in deciding on the course he is to follow, he will do well to steer clear of either extreme; keeping in view, that, although none of the temporary teeth should be removed unless it is urgently called for, it is better to anticipate, by a short time, an operation which will soon be performed by nature itself, than to allow a permanent irregularity of the second set to occur.

It frequently happens, that, notwithstanding every care on the part of the dentist, irregularities, or "crowding" of the permanent

teeth, will happen, in consequence of the great size of the teeth, and the small dimensions of the jaws. In such cases, it is customary with many, to remove one or more of the most irregular teeth, with the view of affording room to the others, and in the expectation that these will so close together as to remove all appearance of the vacancy. In this practice I am not disposed to concur; as, even if the irregularity should be thus removed, (which is not invariably the result,) the want of the teeth is always evident, and occasions a contraction of the jaws, which materially impairs the symmetry of the face. There are instances, indeed, as in the case of the upper canines, when they perforate high up on the anterior surface of the jaw, in which early extraction will be necessary; but in general, the operation ought to be avoided, or at least postponed until it is seen whether the enlargement of the maxillary bones will not afford the requisite space.

IRREGULARITIES OF THE DIFFERENT TEETH.

The irregularities of the teeth are so various, and in almost every case present such different appearances, that it is scarcely possible to give any description of them. I shall endeavor, however, to enumerate those that most frequently occur, and, at the same time, mention the treatment which is adapted to each.

IRREGULARITIES OF THE INCISOR TEETH.

The permanent central incisors of the under jaw occasionally appear before the roots of the corresponding temporary ones have been removed by the absorbents. In this case they always take up their position on the inner side of these, and thus occasion the appearance of a double row of teeth. The lateral incisors sometimes advance in the same direction; but it more frequently happens that these teeth come in edgeways, or with their sides inclining forwards.

Both of these irregularities proceed from the same cause—want of room for the rising teeth, in consequence either of the tardy absorption of the roots of the temporary ones; or, if these have been removed by nature in the ordinary way, from the space which they left being too small for their permanent successors.

In either case, the extraction of the adjoining temporary teeth will be necessary. The permanent ones will then generally of themselves come forward; though the application of the bar will sometimes be required to bring them into a regular position.

The superior incisors are still more frequently irregular, in consequence of their greater size, and the smallness of the space for their reception. The centre ones occasionally perforate the gum in the same unfortunate position, behind the temporary teeth. A similar mode of treatment must be adopted to bring them forward;

and it will generally be necessary to prevent the approximation of the jaws, by the interposition of the ivory.

The lateral incisors of the upper jaw are more frequently irregular than any of the other teeth. They sometimes perforate nearly behind the posterior sides of the centrals, and on other occasions, almost directly in front of their anterior surfaces. If the former occurs, the bar with ivory must be used; if the latter, they may be drawn aside into a more regular position by a ligature attached to the posterior teeth.

A totally different kind of irregularity is often observed in the upper incisors. The teeth in this instance, instead of being crowded together, perforate the gums widely apart, and diverging from each other. The spaces thus left between them are frequently so large as to lead a casual observer to believe that some of the teeth are wanting. At other times they may contain supernumerary teeth.

In both instances ligatures should be applied to bring the teeth nearer to each other, not only to remove the unfavorable appearance, but to afford the space which is required for the regular advance of the posterior teeth. If any supernumerary teeth are present, it will be necessary to remove them.

I need scarcely caution the practitioner against committing the deplorable mistake of removing the permanent, instead of the temporary or supernumerary teeth. This, however, has not unfrequently been done by ignorant or careless persons. It is a blunder of the most serious and unpardonable description, and can never occur with a man of ordinary care and observation.

The canine teeth are very often the subjects of an almost incurable irregularity—a preternatural projection. This partly arises from their great size, and the small space that is usually left for them, in consequence of all of the anterior and most of the posterior teeth having usually taken up their position before the canines perforate the gum; and it seems also partly to proceed from a natural tendency which these teeth have to project; as they are often observed to be irregularly prominent when there is abundance of room for them, and no apparent obstacle to have prevented their assuming a regular position.

When they advance with this projecting tendency, they usually perforate at the deepest part of the alveolar process, immediately below the junction of the gum with the lining membrane of the lips. In this unfortunate position, it is almost impossible to direct them inwards. The bar is here of no use whatever: some benefit may perhaps be derived from frequent pressure with the finger; though the remedy, by this means, is so protracted, that the patient will generally be desirous to have them extracted, in consequence of the deformity they occasion, and the inconvenience.

and even danger, to the lips, which their projection is apt to produce.

When the irregularity of the canines assumes the form of an unnatural inclination inwards, which, however, rarely occurs, it is to be treated with the bar in the ordinary way.

The small grinders often advance in a very irregular direction : in the under jaw, penetrating deeply, and sometimes extending in nearly a horizontal direction from the inner or lingual side of the bone ; and, in the upper, generally projecting, like the canines, but sometimes appearing on the palatal side. The impediment and danger to the motions of the tongue and lips which these malpositions occasion, are frequently considerable.

If any of the temporary molares are present when the bicuspidates perforate in these irregular directions, their removal must be effected. The bar may be applied to bring them outwards, if they have an inward inclination, and pressure made with the finger when the reverse occurs. They ought never to be extracted, unless their position is a source of inconvenience and impediment, as the back situation of the teeth will generally prevent the deformity being observed.

The position of the first and second molares is rarely irregular ; nor does it matter if they are, unless they interfere with the motion of the tongue, &c. But the posterior molaris, or wisdom tooth, frequently advances in a very unfortunate direction. In the upper jaw, it sometimes extends horizontally outwards towards the cheek ; and, in the under, occasionally shoots out from the inner ramus of the jaw, or it may burrow under the large grinder in front of it. If it should unhappily assume the last mentioned position, the most dreadful suffering will inevitably be produced, and will never subside until the opposing tooth is extracted, an operation which cannot be performed too soon. In the two former instances, and in similar ones, when the position of these teeth is a source of inconvenience, they themselves should be removed : though it sometimes will require considerable ingenuity to accomplish this.

IRREGULAR POSITION OF THE UNDER JAW.

It has already been mentioned, that a very unseemly deformity is occasioned by the undue prominence of the under jaw, when the under teeth advance in front of the upper. The complete removal of this may be easily effected by the following simple contrivance :—

A model of the inferior incisors and canines is to be taken, on which a thin gold plate is to be accurately struck up. To the surface of this a piece of ivory is to be fitted and attached, the bone being left prominent on the inside, and filed away on the

outer. The plate being fixed to the teeth by means of small silk ligatures, in the ordinary way, the ivory will strike on the inner side of the upper teeth when the jaws approximate; these will thus be brought forward, and the motion of the jaw will receive an inward inclination.

This may also be effected by means of a piece of pewter, modelled to the teeth; but the mode I have suggested is infinitely preferable.

In conclusion I have to observe, that the treatment of all cases of irregularity ought, if possible, to be attempted before the patient exceeds twelve or thirteen years of age. Until this period, the roots of the teeth are not completely formed, and the attachment to their sockets is comparatively so slight, that they may easily be directed into the most favorable position; but, at a later age, they become so firmly fixed, that it is almost impossible to move them by the ligature.

I am aware that this advice of mine is almost diametrically opposed to that of a high authority, Mr. Bell, who recommends the treatment to be postponed until the individual has attained the adult age. In this opinion I cannot concur. It is totally contrary to that of all the best dentists who have written on the subject. It is especially opposed to that of John Hunter; and, in this instance at least, one may safely say,—*Mullem errare cum Platone, quam cum aliis recte dicere.*

CHAPTER II.

OF IMPERFECTIONS OF THE ENAMEL.

Preternatural Transparency of the Enamel, arising from deficiency of its earthy substance—Chalky appearance of it, arising from Redundancy of this, or want of Gelatin—Denudation of the Enamel—Wearing down of it and the Teeth in Mastication.

WHEN speaking of the enamel and its chemical composition, it was mentioned in what proportion its elements exist, when it is in a state of perfection. It would seem, however, that, on some occasions, its earthy ingredients are defective in quantity; and, at other times, that they do not enter properly into combination. Variations of this nature give rise to corresponding imperfections in the enamel, and alterations in its appearance.

These peculiar conformations are often found to be hereditary; indeed, there is perhaps no feature in which the different members of a family bear a nearer resemblance to each other, than in the formation of their teeth; and this will often be observed,

not only in their general appearance and arrangement, but also in the diseases and affections to which they are subject.

The gelatinous matter which, in perfect enamel, exists in an almost incredibly small proportion, appears frequently to be present in a larger quantity. On other occasions, the earthy elements preponderate. When there is a superabundance of the gelatin, the teeth have a highly delicate and transparent appearance, which at first is exceedingly beautiful, although the attraction is seldom permanent, for they are generally soon attacked by caries, which, in this instance, invariably goes on with great rapidity.

On the other hand, when there is either a preponderance of the earthy bases, or if they do not enter properly into combination, the particles of the enamel are not united with a sufficient degree of tenacity. When this occurs, the teeth have a disagreeably white and chalky-looking appearance, and always rapidly give way.

There is a third species of imperfect formation of the enamel, consisting of a partial deficiency of it on the anterior surfaces of the teeth, especially of the incisors and canines. When the enamel is thus defective, the edges of the teeth have a broken appearance, and their anterior surfaces appear to be notched, or perforated by small superficial openings.

This imperfection seems to arise from the enamel not having been at first deposited in sufficient quantity on these parts of the teeth, by the vessels which secreted it; although it appears inexplicable how this should occur only on some portion of their surface, while the rest is surrounded with the vitreous substance in a state of perfection.

When the teeth are thus affected, they have generally an unhealthy appearance, but are often exceedingly durable.

Analogous to this imperfection is the disease alluded to by Hunter, under the name of "decay of the teeth by denudation." "The first appearance of it," he observes, "is a want of enamel, whereby the bony part is left exposed; but neither the enamel nor the bony part alter in consistence, as in ordinary decay. As this decay spreads, more and more of the bone becomes exposed; in which respect, also, it differs from the former decay; and hence it may be called a denuding process. The bony substance of the teeth also gives way, and the whole wasted surface has exactly the appearance as if the teeth had been filed with a rounded file, and afterwards had been finely polished. At these places, the bony parts being exposed, become brown."

This disease usually first appears on the centre incisors, and thence extends to the lateral, canines, and small grinders; and sometimes, although more rarely, to the molares. It may either

assume the appearance of a regular and polished groove, extending in a continuous line along the whole of the anterior surfaces of the teeth, or the enamel may be removed in rough and irregular patches; and the whole of it may be thus detached from the anterior surfaces and sides of the teeth.

The cause of this disease is involved in much obscurity. Hunter observes, "From its attacking certain teeth rather than others in the same head, and in a particular part of the teeth, I suspect it to be an original disease in the teeth itself, and not to depend on accident, way of life, constitution, or any particular management of the teeth."

WEARING DOWN OF THE TEETH IN MASTICATION.

Connected in some degree with imperfection of the enamel is the occasional total disappearance of it from the edges and crowns of the teeth. This, undoubtedly, to a certain extent, arises from the constant friction of the opposite teeth on each other during mastication, as it is generally observed in sailors, and others who subsist chiefly on hard articles of food, as biscuits, &c. : but it appears still more frequently to proceed from original malformation, which alone will account for the rapidity with which it sometimes goes on.

A very beautiful provision is generally made by nature for the protection of the nerves during the progress of this affection. In proportion as the bodies of the teeth are removed, their vessels and nerves disappear, and the canals are gradually filled up by a transparent osseous substance, which appears to be deposited by the vessels of the internal membrane. It thus happens that when the centres of the teeth are exposed by the advance of the abrasion, no pain is occasioned, as the nervous pulps have been absorbed, and the space they occupied has become solid bone.

Nature, however, does not always provide this bountiful protection. I recently met with the case of an old gentleman, whose teeth had been thus worn down until they became the subjects of serious toothache. The suffering produced by the exposure of the nerves was so acute that I was obliged to remove nine of his teeth, successively, in the course of a month. In the roots of all of them the canals were pervious, and the nerves distinctly visible.

All these affections of the enamel are unfortunately irremediable; although the caries, in which they ultimately terminate, may generally be materially retarded if the teeth are kept clean, and corroding substances prevented coming in contact with them.

CHAPTER III.

OF CARIES, OR DECAY OF THE TEETH.

Its Origin, Prevention, and Treatment.

CARIES is the disease to which the teeth are most subject, and, indeed, it may be considered as the one in which almost all their other affections terminate.

It is a species of mortification or decomposition of their structure, which commences in that part of the osseous substance which is situated immediately beneath the enamel, and extends until it destroys the whole body of the tooth. On reaching the roots its progress is for a time arrested, although these are ultimately also involved in the decay.

The disease arises from a diminution of the vitality either of the whole, or of some part, of the structure of the teeth, in consequence of previous inflammation.

The first appearance of caries is a small dark colored spot on the enamel, arising from the alteration in the texture and color of the bone beneath. The disease has made considerable progress in the interior before it thus exhibits itself externally, as will be observed if a tooth, extracted in this stage, is cut across; the bone immediately below the enamel will be found to be softened and discolored. But the enamel is as yet unaffected, and merely exhibits, through its transparency, the altered appearance of the structure beneath. The discolored spot gradually increases in size and deepens in hue as the disease extends.

Contrary to that law which holds good in every other part of the body, in which every diseased structure is observed to have a tendency to extend towards the surface, caries of the teeth almost invariably proceeds in an inward direction. The enamel is only latterly affected, and although possessed of but little organization, and no living power to enable it to resist disease, yet from the natural disposition of caries to extend towards the centre of the teeth, and perhaps in some degree from the great density of the enamel itself, and its peculiar crystalline texture, it usually happens that it rarely becomes diseased until a great part of the osseous interior has been destroyed.

When the caries has proceeded to a certain extent in the bone, the enamel, being deprived of its support, at last gives way, and leaves an opening into the interior of the tooth. Often, however, it holds out still longer, until the whole of the osseous substance has been destroyed, when by some trifling accident the tooth is

broken over, and discovered to have been reduced to the condition of a shell, although little or no external decay had previously been observed.

The whole of the body of the tooth being now removed, the farther advance of the disease is for some time retarded, the greater vitality which the roots possess enabling them to hold out longer against its encroachment. They will frequently remain sound in their structure, and firmly attached to their sockets, for many years after the crowns of the teeth have been destroyed. But when in this state, the roots no longer possess the same vitality as before, as the vessels and nerves in the canals have been removed by absorption; and they are to be considered as little better than foreign bodies in the mouth. Nature itself, indeed, seems to indicate this, and makes an effort to expel them. They are generally at last removed, partly by expulsion from their sockets, and partly by the action of the absorbent vessels.

The teeth are subject to caries at all periods of life, no age being exempted from this disease. It is, however, most apt to occur in early years. The temporary teeth are especially liable to it; and the permanent ones are more frequently attacked during the first few years after their formation than at any subsequent period. This undoubtedly, to a certain extent, proceeds from several circumstances at this time leading to the production of the disease; as the pressure of the teeth on each other, from want of room in the maxillary bones, and especially to inattention to cleanliness on the part of the individual. But it also arises in consequence of the nerves and vessels of the teeth being then in a more active and irritable state, and of course more apt to become the subjects of irregular action. This view of the case is confirmed by the observation, that after forty-five or fifty years of age the teeth more rarely become carious, their sources of organization being then considerably impaired, or having altogether disappeared.

All classes of the teeth, and every part of their bodies, are, *cæteris paribus*, equally subject to caries, although the form and position of some of them render them more so than others. Thus the molares, from their greater extent of surface and the inequalities of their crowns, afford more facility for the commencement of the disease than the canines or incisors, and are more frequently observed to become carious, especially in the under jaw.

The upper incisors are also exceedingly apt to become affected, when they are in close contact with each other. The disease, in this instance, is either caused or accelerated by their pressure on each other; as it is almost invariably observed to commence on their sides, where they are in apposition, and usually goes on with great rapidity; although the affected teeth do not contami-

nate the sound ones, as is generally supposed, and even asserted by Mr. Fox. Still less reason is there to believe in the supposition of this gentleman, that an "acrimonious discharge," arising from the carious tooth, acts contagiously on the adjoining sound ones; for it is certain that there is no such secretion. The cause of the decay is simply the pressure; and the disease is usually extensive and rapid, because what produced it in one tooth will occasion it in another.

The incisors of the lower jaw are not so liable to become carious, and the disease rarely commences on their sides, however close they may be in contact. This probably arises from the comparative thickness of their enamel, and the small proportion of the bone in the bodies of these teeth; as, when caries does occur here, it is usually observed to begin on the neck of the tooth, or on the lateral part of the root adjoining it.

The canines, when unaffected by lateral pressure, are least liable of any of the teeth to become carious, and the wisdom teeth are most so.

The teeth are generally observed to decay in pairs. When a tooth on one side of the mouth is carious, its fellow on the opposite will usually be found to be in nearly the same condition. This is a well known occurrence, although it is often a matter of surprise, and the cause of it rarely understood. A moment's reflection will explain the mystery, if we consider that the teeth were originally formed in pairs, that their organization must of course be nearly equal, and that if it has in the instance of one yielded to this disease, the other cannot be in a condition to resist its attack.

Caries leads not only to the premature and total destruction of the teeth, with all the injurious effects upon the speech, appearance, and health in general, incidental on their loss; but is the source of one of the most painful affections to which mankind is subject. When the disease has made an opening into the centre of the tooth, inflammation of the highly delicate lining membrane of its canal generally ensues, and occasions the well known affliction of toothache.

Sometimes, however, no pain results from the exposure of the interior of the teeth, in consequence of the membrane and the enclosed nerves and blood vessels having been removed by the process of absorption, in proportion as the caries extended its ravages. It thus frequently happens, that the whole of the teeth may be destroyed by this disease, without the individual experiencing the slightest pain. This provident protection occasionally afforded by nature, is especially observed in the decay of the temporary teeth, when the delicate frame of the child is less able to endure the pangs of toothache.

ORIGIN AND CAUSE OF CARIES.

Considerable diversity of opinion exists on the question of the origin of this disease, and different explanations have been given by the three leading authors, to whom I have already alluded.

The theory proposed by Hunter is exceedingly imperfect, as his unfortunate belief in the non-vascularity of the teeth prevented him from giving that correct explanation which he otherwise would have made. He says, "It is such a decay as would appear to deserve the name of mortification; but there is something more, for the simple death of the part would produce but little effect, as we find that teeth are not liable to putrefaction after death; and therefore, I am apt to suspect, that, during life, there is some operation going on, which produces a change in the diseased part."*

The opinion of Fox is still more unsatisfactory. He seems, indeed, to have been almost aware of the true origin of the disease, although he does not express himself with his usual felicity. He says, "If a sound tooth that has been recently extracted, be broken, the membrane will be found to be firmly attached to the bone of the tooth, forming the inner cavity. But when this membrane becomes inflamed, it separates from the bone, and the death of the tooth is the consequence. That this is the proximate course of caries, appears to be highly probable, by remarking, that a caries of other bones is caused by a separation of those membranes which cover them, and which are attached to them. Thus, a separation of the periosteum will cause a death of the *tibia*; or that of the *pericranium*, a caries of some part of the bones of the head."†

It is not necessary for me to point out the inconsistency of this explanation. It has been already ably done by Mr. Bell, who remarks that, "Exclusive of the circumstance that caries is, in this passage, confounded with necrosis, it contains, in every respect, a false view of the question."‡

The theory which the latter gentleman has proposed, I conceive, approaches nearer to accuracy than either of those of his predecessors, as it is substantiated not only by his own matured observation, but also by his discernment of the rocks on which those who preceded him had foundered. Concurring thus with him in opinion, I shall here insert, in his own words, the improved explanation he has proposed.

"The true proximate cause of dental gangrene (caries,) is inflammation; and the following appears to me to be the manner in

* Nat. Hist. of the Teeth, p. 135. † Diseases of the Teeth, p. 13.

‡ Bell on the Teeth, p. 123.

which it takes place: When, from cold, or any other cause, a tooth becomes inflamed, the part which suffers most severely is unable, from its possessing comparatively but a small degree of vital power, to recover from the effects of the inflammation; and mortification of that part is the consequence. That the bony structure of the teeth is *liable* to inflammation, appears not only from the identity of the symptoms which take place in them when exposed to causes likely to produce it, with those which are observed in other bones when inflamed; but more conclusively still from the fact already mentioned, that teeth are occasionally found, in which distinct patches, injected with the red particles of blood, have been produced by this cause, after the continuance of severe pain. A tooth which has been the subject of inflammation, will often remain without any diseased appearance for weeks or months afterwards; but at length the consequences which I have described become obvious, by the occurrence of a darkened spot which shows itself through the enamel; and the gradual destruction of the tooth follows, if means be not taken to arrest its progress. I have known a case in which inflammation had taken place through all the molares of one side, both above and below; and notwithstanding it was speedily subdued by leeches, &c. yet within a year afterwards, scarcely any of the teeth so affected had escaped the attacks of gangrene, although the corresponding teeth on the other side remained free from disease.

“The situation in which gangrene invariably makes its first appearance, immediately under the enamel upon the surface of the bone, is, I think, explicable only with the view I have taken of the structure of the teeth and the nature of this disease. As the vessels and nerves which supply the bone of the teeth, are principally derived from the internal membrane, it is natural to conclude, that, in so dense a structure, the organization would be less perfect in those parts which are farthest removed from its source; and that, in the same proportion, they would be less capable of resisting the progress of mortification as we find that those parts of the body that are farthest removed from the source of circulation, are more particularly prone to gangrene, and those diseases which arise from want of activity in the sanguiferous system.”

OF THE REMOTE OR PREDISPOSING CAUSES OF CARIES.

Although caries of the teeth does not appear to arise from causes which affect the general health, many persons of robust constitutions being observed to be exceedingly prone to this disease, and others, although of a more delicate frame, are almost wholly free from it, yet it is undoubtedly materially influenced by predisposing causes.

The first of these, perhaps, is hereditary predisposition; for it

will generally be remarked, that, if the parents have bad teeth, the mal-formation will, in all probability, be reproduced in their offspring; and it is by no means uncommon to find the teeth of different individuals of a family decaying in exactly the same way, at corresponding periods of life.

Imperfect congenital formation is another of the principal predisposing causes of caries. This may proceed either from the rudimentary pulps having been in an unhealthy condition, or it may arise from the inactivity of the vessels by which the enamel and osseous substance were secreted. Either of these occurrences will impair the organization of the teeth; and, of course, render them more prone to disease.

Another predisposing cause of caries is the irritation produced on the constitution and general health of the child, by all those diseases incidental to infancy, which usually occur at the time that the permanent teeth are in the act of being formed.

Febrile diseases, and all those affections that are attended with long confinement, dyspepsia and sedentary habits, often give rise to caries of the teeth. It has been remarked, that the disease is particularly apt to arise during the confinement attending on parturition.

But of all the injurious agents on the teeth, and predisposing causes to early decay, there is none, I believe, so frequently destructive as mercury. The effect of this medicine on the teeth is usually observed only at a more advanced period of life, when the operation of "the specific" on the mouth is considered as a criterion of its introduction into the system. But I am convinced that it is in earlier years that most mischief is done by mercury, and observe with regret, that the importance of this circumstance has not hitherto been sufficiently noticed by preceding authors. The large and continued doses of calomel which are so indiscriminately given to children, for almost every disease, either by weakening the constitution, prevent the proper formation of the teeth, or, by the powerful stimulus which mercury always exerts upon the absorbent vessels, cause the absorption of their substance as soon as it is deposited. I am convinced that it is solely from this use, or rather abuse, of calomel, that we must trace, not only the origin of that tendency to early and extensive caries, which so frequently terminates in the total and premature destruction of the teeth of youth; but also, that it is from the same source that those deficiencies of the enamel proceed, which are considered as unaccountable, and from which the teeth sustain irreparable injury.

EXCITING CAUSES OF CARIES.

When there exists any predisposing tendency to caries, the disease will be readily induced by any of those exciting causes which act more immediately on the teeth.

The first of these unquestionably is the neglect of the individual to preserve the teeth in a state of purity. If the tooth-brush is not frequently used, the particles of the food will accumulate on the teeth, and, there undergoing decomposition, not only taint the breath while it passes through the mouth, but act injuriously on the teeth by their corroding influence.

The extensive caries which is so often observed in the teeth of youth, arises almost solely from inattention to cleanliness, although this is rarely confessed, and the disease is almost invariably attributed to the predilection of children for sugar, &c. Now, notwithstanding the antiquity of this popular explanation of premature destruction of the teeth, I do not believe that it has much foundation in reality, nor that any substances which are taken with impunity into the stomach, will act injuriously upon the teeth.

Another exciting cause of caries is the pressure of the teeth on each other. This is especially observed in the front teeth of the upper jaw, where the space for their reception is so small. The teeth are thus generally in close contact at their sides, and by the continued pressure which they exert on each other, the crystalline texture of the enamel is gradually broken down. When the osseous interior is thus exposed, caries commences, and generally goes on with great rapidity; although there is no reason to believe that the affected teeth then act contagiously on the sound, as is popularly supposed, and even asserted by Mr. Fox, who says, "When the caries is communicated by contact, it probably arises from the action of some acrimonious discharge from the decaying tooth, which, in the first place, occasions a decomposition of the enamel, and afterwards the destruction of the tooth. But there is this peculiar difference, that, in the one, the decay proceeds from the interior to the exterior part; whilst, in the other, it commences on the surface, and extends to the cavity." I have already remarked how circuitous and improbable this explanation is, and that it is much more natural to suppose that, as the pressure on the teeth is equal, they will be affected by it in exactly the same way.

Finally, all external injuries, blows, &c. or any inflammatory affection of the teeth, as that induced by exposure to cold, or by the formation of tartar, may be considered as exciting causes of their decay, although the disease may not appear until a considerable time after the inflammation has subsided.

PREVENTION AND TREATMENT OF CARIES.

It may appear somewhat empirical to talk of the prevention of any disease, and especially of this, a charm or specific against which every charlatan who displays himself in the daily journals, pretends to possess. These have been so invariably proved to be completely delusive, that one may safely predict that the day is not remote when even the most credulous will be no longer duped by such statements. The progress of caries of the teeth may indeed be almost always materially retarded by an efficient practitioner, but the prevention of it is almost exclusively confined to the patient.

Care should be taken to preserve the teeth in a state of purity. For this purpose an ordinary tooth-brush with water will be sufficient, although a little of some impalpable powder, that acts by a gentle friction, may be used with advantage. In warm weather, water at the ordinary temperature may be used; but during winter, or in cold climates, it should be slightly warmed; for it is an object of considerable importance to allow no fluids, nor any substance, to come in contact with the teeth, if their temperature is either so high or so low as to injure these organs by accelerating or diminishing their natural heat.

All exciting agents should be carefully removed. The teeth should be occasionally examined by the dentist, and any tartar removed which may have accumulated, lest the irritation which this foreign body always produces in the gums should be extended to the teeth, from the close connection that subsists between them.

All acids and acidulous fluids should be sedulously avoided, as they not only highly irritate the teeth, but decompose their substance, and especially their enamel. When it is necessary to administer them medicinally, as in some febrile diseases, they should be sipped through a tube, or common quill, to prevent, as much as possible, their coming in contact with the teeth; and the farther precaution ought to be taken of rinsing the mouth with water after using them.

Although all the acids, and substances containing them, are highly injurious to the teeth, yet empirical practitioners do not hesitate to employ these for the purpose of cleaning them; the preternatural whiteness which acids always impart to the teeth before destroying their substance, forming the attraction which cupidity on the one side holds out to vanity on the other. It is scarcely necessary to say, that all such charlatans, with their tooth powders and "dentifrices," that are "guaranteed to produce white teeth," should be sedulously shunned. If, notwithstanding repeated warnings, persons are still found sufficiently credulous to employ them, their destructive effects will soon be discovered;

the teeth, at first rendered unnaturally white, quickly lose their color, and, in general, rapidly decay; or, in the few instances in which their texture is not totally destroyed by such treatment, the patient is perpetually annoyed by their subsequent extreme irritability.

It has been already mentioned, that one of the chief exciting causes of caries is the injury done to the enamel by the pressure of the teeth on each other. This may, in most cases, be prevented by attending to the mouth at the period that the permanent teeth advance; and following that treatment, which, when speaking of irregularities, was recommended for obviating what is termed "crowding of the teeth." When the teeth are thus, from want of room, forced into an irregular position, it is the common practice to extract one or more of them, to afford space to the others—a course which cannot be too severely reprehended, as the whole of their number may almost invariably be retained, and brought into a regular arrangement by the use of the bar and ligatures, in the hands of a dentist of ordinary skill.

In those cases in which the caries has commenced on the sides of the teeth before the practitioner is consulted, it will be requisite for him to remove it by passing a smooth thin file between them; a remedy, however, which should not be resorted to, unless it is imperatively called for by the progress of the disease. The greatest care must afterwards be taken by the patient to keep the space clear, and allow nothing injurious to the teeth to accumulate within it. Considerable benefit may also be derived by the occasional application of a little lint moistened with the camphorated spirit of wine, or some similar anti-septic tincture. When the cavity made by the progress of the disease is larger, and its situation is favorable for the retention of artificial substance, the whole of the carious part should be removed, and gold leaf introduced in its place. The mode of accomplishing this "stopping," or "stuffing," will afterwards be detailed when speaking of the various operations on the teeth.

These are the local remedies for caries; and the nature of the disease seldom admits of any other treatment. Occasionally, however, much benefit may be derived by the application of leeches to the surrounding gum, and afterwards promoting the bleeding by warm fomentation, in those cases where the teeth have been attacked by inflammation, which, if not thus subdued, might terminate in their decay.

Before concluding this chapter, it may be well to say a few words regarding the roots of the teeth which have been destroyed by this disease.

When the fangs are sound, and occasion neither pain nor inconvenience, it is well to leave them as they are; as they afford considerable support to the adjoining teeth, as long as their sockets

remain unabsorbed, and facility for the attachment of artificial teeth if required. But if the disease appear to be going on in them, or if their presence produce any irritation of the gum and sockets, they should invariably be removed. Indeed, the necessity of this practice is indicated by nature herself, as it is observed, that when the bodies of the teeth are gone, the roots are not only gradually removed by absorption, but are at the same time expelled by a deposition of osseous substance in the bottom of their sockets.

CHAPTER IV.

OF TOOTHACHE AND ITS TREATMENT.

WHEN, by means of the progress of caries, an opening has been made into the centre of a tooth, and the internal membrane is exposed to the action of the air, saliva, and other irritating agents, inflammation of it ensues, and gives rise to the well known affection of toothache.

In this disease all the usual symptoms of inflammation occur, especially increased vascularity and swelling. The latter characteristic, indeed, is the cause of the violently acute pain which this affection so generally occasions; as the solid and unyielding sides of the canal will not permit of that distention of the membrane which its increased volume would require. The expansion of it is thus wholly directed inwards, and, by the compression of the nerve, gives rise to the exquisite suffering.

There is perhaps no disease, arising from a source apparently so trivial, which occasions suffering so severe as that of toothache. The affection is so often experienced by a great majority, if not the whole, of the human race, that it is unnecessary to give any description of its symptoms: or, indeed, would this be an easy matter, as the form which it assumes, and the sensation which it communicates, vary in different individuals. In some instances the pain is of a dull, gnawing description, and incessant; in others it is periodical in its attacks, and exceedingly acute. In all cases it is aggravated by the approach of any object that is likely to irritate the excited nerve, as a draught of cold water, or of air, exposure to inclement weather, or any similarly exciting agents.

From the sympathy which exists between the teeth and the rest of the body, the pain is rarely confined to the seat of the disease, but is generally extended to the adjoining parts, giving rise to painful swelling of the face, headache, irritation of the ear, &c. Earache, indeed, as I have already mentioned, very often occurs from the excitement of some of the posterior teeth; the wisdom

teeth of the under jaw are most frequently the cause of it, in consequence of the communication which exists between the ear, and the inferior maxillary nerve at the posterior part of the jaw, by means of the chorda tympani. From a knowledge of this circumstance, it will be obvious how requisite it is to make a careful examination of the teeth, when any inflammation arises in the ear; and if a carious tooth is discovered, which, from its situation, is likely to be the cause of the auricular irritation, extraction of it should be performed, and will generally afford relief.

Sometimes the pain is more acute in these adjoining parts, than in the affected tooth itself, or it may be communicated to the adjacent teeth; for it is by no means uncommon to find the toothache attributed to a perfectly sound tooth, while little or no pain is experienced in the diseased one. This frequently occurs in disease of the molares, and especially of the *dentes sapientiæ*; the pain arising from the excitement of one of these teeth being often referred to those adjacent.

TREATMENT OF TOOTHACHE.

The treatment of toothache may be either palliative or radical; the former consisting in the application of remedies which may temporarily alleviate the pain, and afterwards allow the cavity to be filled up with gold, to prevent its recurrence: the latter, it is almost needless to observe, is the extraction of the tooth.

The palliative means suggested for the cure of toothache, are innumerable; as the empiric has in no department of the medical profession exerted himself so industriously as in his efforts to discover a remedy, or (what answers the purposes of the charlatan equally well) a pretended one, for this very common affliction. I shall not, however, notice any of these precious nostrums, but leave them entirely to that publicity which their modest and ingenious "inventors" find for them, through the medium of the daily journals.

The remedies occasionally employed with this view, by respectable medical practitioners, are diametrically opposite in their nature and mode of acting; anodyne applications being recommended by some, for the purpose of diminishing the sensibility of the nerve; and pungent or caustic ones by others, with the object of destroying it. Both of these have been applied occasionally with benefit; the first being generally more agreeable to the feelings of the patient, but often uncertain in their effects; while those of the other class, although they usually increase the pain at the moment of application, yet frequently act so powerfully on the nerve, as to ensure its destruction.

Among the anodyne applications, those containing opium, or any of its concentrated preparations, are generally the most bene-

ficial. A little cotton lint, moistened in tincture of opium, or Battley's solution, and applied to the tender tooth, will often alleviate the pain. The tinctures of aconite, belladonna, hyosciamus, &c. have also been frequently used with temporary success.

It has been supposed that the spirit of wine, with which all these preparations are made, (excepting Battley's solution,) is nearly as efficacious as their anodyne bases; as it has often been found to diminish the pain, either when applied in a concentrated state, or when diluted with an equal quantity of water, as in the form of brandy; or again, when, by being combined with an acid, it has undergone that peculiar change by which it is converted into ether.

Medical practitioners, besides recommending anodyne preparations to be locally applied, frequently administer them internally, for the purpose of diminishing the general nervous excitement. A professional friend of mine, a distinguished physician in Dundee, Dr. Nimmo, who, like the majority of medical practitioners, is averse to performing the operation of extraction, usually prescribes:

R Mistur. Camphor.	. . .	3 vi.
Tinct. Opii,	. . .	Gtts. xxxvi.
Vin. Tart. Antimon.		Gtts. xvi.

The same gentleman has informed me that the tinct. saponis cum opio, made warm, and applied externally to the jaw, will be found exceedingly useful.

The pungent applications that are used consist chiefly of the stronger essential oils. A drop of the essential oil of cinnamon, or of cloves, introduced into the cavity of the tooth, is said frequently to alleviate the pain. Camphor has also been mentioned as occasionally useful.

Of the caustic applications, the nitrate of silver is the best, and I believe was much recommended by the celebrated Abernethy. It may be applied either by introducing a small piece of it into the cavity of the tooth, or, in the state of a strong solution, with a hair pencil. In either case it is necessary to cover the carious opening with a little cotton, to prevent the diffusion of the caustic, and the injurious effects of it on the tongue and adjoining parts, if it were allowed to come in contact with them.

The stronger acids, especially the nitric, have also been recommended for this purpose: but the practice appears reprehensible, as they will seldom be found beneficial, and they invariably destroy the substance of the tooth.

The actual cautery, as a remedy for toothache, (the only affection for which I believe it is now retained,) is rapidly falling into

disuse, not only from its formidable appearance, which is generally far more alarming to the patient than the extraction of the tooth, but also from the uncertainty attending its application; as, from the smallness of the canals of the teeth, and, in the molares, in consequence of the diverging of the roots, it can rarely, or rather never, be applied so effectually as to destroy the nerve.

The absurd and cruel practice of applying blisters to the cheeks, &c., for relieving the pain of toothache, is still more reprehensible, and is only noticed here for the purpose of stating that it should never be followed.

Great benefit will frequently be derived from the application of leeches to the gum surrounding the excited tooth, and afterwards promoting the bleeding by fomentation. This local bleeding is especially beneficial, when resorted to in the early stage of the disease.

These are the principal palliative remedies for alleviating the painful symptoms of toothache, although they are at best always uncertain in their results, and often totally fail. But should they in any instance be successful in removing the pain, no time should be lost in permanently filling up the cavity with gold leaf, to prevent its recurrence. The mode of doing this, and the precautions requisite to ensure a successful result, will be explained when detailing the operations on the teeth.

The radical cure for toothache, extraction of the excited tooth, is, however, undoubtedly the surest. The pain of the operation, when scientifically performed, is often far less severe than that of the disease, or the application of these alleviating means, and the result of it is invariably decided. The mode of performing extraction will afterwards be mentioned.

CHAPTER V.

Of Exostosis of the Teeth, or Swelling of the Roots—Of Necrosis, or Total Death of the Tooth—Of External Injuries of the Teeth—Fractures and Dislocations.

EXOSTOSIS of the teeth consists of a preternatural and diseased increase of the substance of their roots, arising from some peculiar action of the dental periosteum.

The disease apparently derives its origin from some inflammatory affection of this membrane, and is rarely observed in teeth that had been sound before its appearance. In almost every instance it will be found that they have previously either been attacked by caries, or undergone some degree of inflammation.

The seat of exostosis is entirely confined to the roots, which

often extensively affected by it, while the bodies of the teeth appear healthy and sound.

The newly deposited osseous substance differs considerably in appearance from that of the natural bone of the teeth. It is of a lighter and more transparent color, and is irregularly deposited around the roots. By these characteristics the disease will be easily recognized, when the teeth that have been affected by it are removed from their sockets; but before their extraction it is always extremely difficult to discover it.

The pain which exostosis occasions is of a dull, deep-seated nature, and frequently incessant. This sensation is generally communicated to a number, or perhaps the whole of the teeth, as the disease is rarely confined to one of them, but several are generally affected at the same time. From this circumstance, and the healthy appearance which the bodies of the teeth usually present while their roots are thus affected, the pain has not unfrequently been supposed to proceed from *tic douloureux*.

On other occasions, however, absorption of the interior of the sockets takes place, in proportion as the deposition proceeds on the roots; and space being thus afforded for their enlargement, no painful symptoms will be experienced.

TREATMENT OF EXOSTOSIS.

In the first stage of the disease, recourse should be had to local bleeding, for the purpose of subduing the inflammation in the membrane; but after the osseous matter has been deposited, and given rise to the more painful symptoms, no permanent relief can be afforded by any other means than the extraction of the tooth; a measure to which both the patient and practitioner are equally averse, as, from the disease being confined to the fangs, and not affecting the external appearance of the teeth, it is rarely discovered until they are removed, and it is difficult to determine which of them are to be extracted; unless, indeed, the practitioner is assisted in his prognosis by the sudden pain which the patient feels when the affected teeth are unexpectedly touched by some hard substance during mastication, or when smartly struck with the handle of any small instrument—a mode of indication which it may be well to keep in view.

NECROSIS, OR TOTAL DEATH OF THE TEETH.

Necrosis is another disease of the teeth incidental on inflammation, terminating in the total destruction of their vitality.

The inflammation which gives rise to this disease, is always of a severe description, and may be excited either by long continued irritation, as from the effect of a course of mercury upon the dental membranes, or it may be the result of injury of the teeth

by external violence, when it has been sufficiently great either to break or dislocate them, or to rupture the vessels and nerves as they enter the canals.

When a tooth is thus deprived of its vitality, it shortly afterwards loses its natural color, and becomes of a darker hue. In this condition it will frequently remain for a number of years without producing any annoyance; but, in most instances, it has a tendency to separate from its socket, which is increased by the formation between them of a hard and dark colored body resembling tartar, which tenaciously adheres to the fang. The root also presents a diseased appearance, and irregular, or partially excavated surface.

The irritation excited by the presence of the dead tooth—now a foreign body in the mouth—produces sponginess and ulceration in the surrounding gum, and very frequently gives rise to disease and suppuration in the socket. The purulent matter which is discharged is generally extremely offensive, and will for a long time continue to issue from the neck of the tooth, or by one or more small openings through the socket.

All the teeth are liable to become the subjects of necrosis, but the upper incisors and canines are most frequently affected.

TREATMENT.

In the treatment of this disease, unfortunately but little can be done, as, at the time that it is observed externally, the vitality of the teeth has been completely destroyed. If there exists any inflammation of the dental membrane arising from the effects of mercury, the medicine must be discontinued, and local bleeding, either by scarification or by leeching, resorted to, for the purpose of preventing the irritation extending to such a height as to lead to the separation of the periosteum from the tooth. But if this communication has once been destroyed, no subsequent efforts will ever re-establish it, nor any treatment, excepting the extraction of the tooth, be beneficial. The practice of applying astringent injections between the tooth and its socket, although recommended by some writers, I have never found beneficial, and consider it little better than waste of time and prolongation of inconvenience to the patient. They never will succeed in permanently stopping the discharge unless the cause of the excitement is removed.

But if the necrosed tooth be firm in its socket, and occasion no suppuration, extraction of it will be unnecessary, as it will often remain in this condition for many years, without any farther annoyance to the individual than the loss of its color.

FRACTURES AND DISLOCATIONS OF THE TEETH.

It has been mentioned that external violence was one of the causes of necrosis of the teeth; and as fractures and dislocations of them almost always terminate in that disease, it may be well to notice them here.

Fractures of the teeth are usually occasioned by an accidental fall, blow, or any hard substance unexpectedly coming in contact with them during mastication, as shot in game, stones in bread, &c. Slight fractures, or rather chippings of the teeth, are also very often occasioned by the common but injurious practice of using them for dividing threads.

If the fracture is not extensive, it will only be necessary to file down the sharp edge to prevent its injuring the tongue. The tooth will often remain in this condition for many years without losing its color, or showing any tendency to become carious.

But if so large a portion of the tooth is broken off as to expose the canal and the nerves, or if the fracture assume the appearance of a splinter, extending in a perpendicular direction along the course of the root, the inevitable result will be the complete death of the tooth; and it then becomes a matter for consideration whether the remaining part of the tooth is to be extracted or filed down, so as to allow of another tooth being pivoted upon the root. If the tooth be splintered in the peculiar way I have mentioned, it should invariably be removed, for the sides of the fracture will never re-unite. In the other instance, if the patient is young, it is better also to extract the root, as the adjoining teeth will gradually approximate and fill up the vacancy. At a more advanced period of life, and if the accident has occurred in any of the six front teeth of the upper jaw, the pivoting operation may be performed with advantage.

DISLOCATION OF THE TEETH.

It frequently happens that the teeth, instead of being broken by the violence of the blow, are entirely turned out of their sockets, or driven into the substance of the maxillary bones. In either case, although they may again become firm, if placed in their former position, they rarely, or rather never, recover their vitality. In the former instance, however, an attempt should always be made to restore them, if too much time have not elapsed after the accident. The socket is to be syringed with warm water, to remove any coagulated blood; and the tooth, after being carefully cleared of all extraneous matter, should be replaced as nearly as possible in its former position, and retained there by a ligature attached to the adjoining teeth, until it adheres, which it frequently will in an incredibly short period.

When the teeth have been forced into the substance of the bone, it is better to extract them at once, than to endanger the risk of the exfoliation, which may occur if they are allowed to remain, or an ineffectual attempt made at replacement.

CHAPTER VI.

OF TARTAR ON THE TEETH.

THE name of tartar has been applied to a calculous substance which is deposited from the saliva, and adheres to the surfaces of the teeth. It forms the most common of all their affections; being observed, in a greater or less degree, in the teeth of almost every individual, and is one of the most frequent sources of irritation of the mouth.

Different explanations have been given of the origin of tartar; some persons believing that it is deposited from numerous minute glands, which they imagine to be situated in the gums, although no trace of these can be observed; and others, among whom is the eminent Delabarre of Paris, supposing that it is secreted by the mucous follicles of the mouth. Both of these opinions are undoubtedly erroneous, as the saliva is the only source of this secretion.

Many circumstances tend to confirm this generally received opinion, but no other need be mentioned than the following: All the earthy salts of which tartar consists, are found to exist in the saliva itself. The deposit is always observed in greatest quantity on those teeth which, from their situation, are most exposed to the action of that fluid, as on the inside of the inferior incisors, where the ducts of the sublingual gland open, and on the outer side of the upper molares, in the immediate vicinity of the duct of the parotid; and tartar has also been frequently found in these ducts themselves, especially in the sublingual, where it has sometimes accumulated in so large a quantity, as, in several instances, to have given rise to ranula.

On being deposited from the saliva, the particles of the tartar unite with the mucus of the mouth, and form a yellow colored crumbling substance, which, settling upon the teeth, adheres to those parts of them that are least exposed to the friction of the tongue, &c. It will thus generally be observed to exist in the spaces between the sides of the teeth, and especially in the under jaw, on which, from the principle of gravitation, it naturally has the greatest tendency to collect.

If the tartar thus deposited is allowed to remain, it rapidly becomes much harder, and adheres with increased tenacity. It also changes in color, becoming of a darker brown hue, and some-

times nearly black ; the particles of it, when soft, readily receiving a tinge from many articles of luxury in ordinary use, as port wine, tobacco, &c.

The matter that has been deposited, forms a nucleus for future increase ; and it often thus collects in such quantities, as to form a body much larger than the teeth which it surrounds. Indeed, several of these are sometimes found to be enveloped in one mass of tartar.

A tendency to this deposition from the saliva, it has already been observed, is exhibited in almost every one ; but it appears to be materially increased by some constitutional affections. Tartar is always found to collect in an unusual degree, on the teeth of persons who are of a sedentary disposition ; or of those who are subject to indigestion. It also generally accumulates during fevers, or any long continued state of inactivity, especially parturient confinement.

It is materially influenced by the habits of the individual, being generally found in largest quantities on the teeth of those who are accustomed to stimulate their salivary glands by the use of such noxious substances as tobacco, &c. ; and in persons who have undergone a mercurial course.

EFFECTS OF TARTAR.

The injurious effects of tartar are first visible on the gums, which, by the irritation constantly kept up by the presence of the calcareous foreign body, fall into a state of sponginess, turgescence, and chronic inflammation. They become much increased in size, and of a deep red color, arising from the large quantity of blood in their vessels, and the prevention of its free circulation. They are thus extremely apt to bleed ; and the hæmorrhage, on a very slight incision, will often be profuse. Ulceration of them also frequently arises from this cause.

The irritation is quickly extended from the gums to the alveolar processes, and, by the undue stimulus which it communicates to the absorbent vessels, leads to the rapid absorption of their substance, and the premature loss of the teeth.

A disagreeable taint is always communicated to the breath, by the presence of tartar on the teeth. This offensive affection, indeed, very often proceeds from this cause, although it is generally attributed to a deranged state of the digestive organs.

Tartar is, by most authors, considered to be one of the chief causes of caries. In this opinion, I am scarcely disposed to concur, as the deposition is generally most frequently found on teeth that are perfectly sound, and rarely become carious ; as in the instance of the lower incisors. But there is a peculiar species of tartar, of a greenish colour, which is very apt, from want of

cleanliness, to be formed on the teeth of youth, especially on the anterior surfaces of the superior incisors and canines, that appears to be highly corrosive of the enamel, and in every instance rapidly leads to the destruction of the teeth, unless it is removed.

TREATMENT.

The only treatment that will be beneficial for the prevention of these injurious effects of tartar, or retarding their progress when they have commenced, is the entire removal of the source of the irritation. The mode in which this operation (known by the name of "scaling" the teeth) is performed, will be afterwards explained. In the meantime, it may be observed, that much may be done towards preventing the accumulation of the secretion, by the use of the tooth brush, &c.; although the most careful attention on the part of the individual will not prevent the formation of this deposit, which, in many instances, collects so rapidly as to require to be removed by means of instruments, generally at the end of every twelve months, and frequently several times in the course of a year.

The early removal of it is always productive of the greatest benefit, and it is never too late to make the attempt; as the teeth, even although considerably undermined by it, will generally again become firm, and the gums assume a healthy appearance, as soon as the source of the irritation is removed.

CHAPTER VII.

DISEASES OF THE GUMS AND SOCKETS.

Of Sponginess, or Chronic Inflammation of the Gums—of Abscess in the Gum, or Gum Boil—of Tumors of the Gums—Treatment of these various Affections—of Absorption of the Sockets, and Loosening of the Teeth—Injurious effects of Mercury on the Gums, Teeth, and Sockets.

THE first disease of the gums which I shall notice is the very common one known by the name of sponginess. This affection was, by the older authors, termed "scurvy in the gums,"—a name applied on very erroneous grounds, as, in general, it has not the most distant connection with that constitutional disease, and is, in a great majority of cases, observed in those who have not the slightest scorbutical taint. It is true that, in those whose constitutions are affected by scurvy, the symptoms of the disease are generally first observed by the effects of it on the gums: but the appearance which they then present is very different from that of ordinary sponginess.

Sponginess of the gums arises from inflammation, by the ordinary symptoms of which,—increased sensibility, redness, swelling, and determination of blood to the surface,—it is characterized. The inflammation is generally induced by the presence of tartar, by cold, or some similar irritating cause, and is seldom observed until it has assumed the chronic stage.

From the large quantity of blood that enters their vessels, and the inactive condition of them being unable to effect its return, they become surcharged with the fluid, and often bleed profusely, from the slightest cause. They also, from this increased vascularity, become much enlarged, and either separate from the teeth, or but loosely surround them,—presenting an irregular, and frequently ulcerated appearance. The irritation is rapidly extended to the alveolar processes, and the absorbent vessels being stimulated by it, the sockets are destroyed, and the teeth become loose, and drop out.

The sensibility of the gums is generally greatly increased during this affection; but, in some cases, they often appear to be in a state of high irritation, without causing much pain to the individual.

TREATMENT.

The treatment consists, first, in removing any source of irritation that may be discovered. If there is tartar on the teeth, it must be removed by scaling instruments.

Much benefit will be derived from local bleeding, which may be easily induced by the tooth-brush, or by a slight incision of the lancet. The incision may either be made, horizontally, across the fangs of the teeth, or, in a perpendicular direction, between them. The latter mode is the preferable one, as the blood vessels are thus more effectually divided, and the enlargement of the gums is diminished by the contraction that follows the re-union of the wound.

The mouth should be frequently rinsed with some slightly stimulating astringent lotion. The common infusion of roses answers very well; but the tinctures of myrrh, of bark, or of camphor, in the proportion of one or two small spoonfuls to a glass of water, are perhaps better.

In those cases in which the gums have become affected in consequence of scorbutical affection, the constitutional treatment requisite for that disease must be followed, before they can be brought into a healthy condition.

OF ABSCESS IN THE GUM, OR "GUM BOILS."

These are induced by a more active state of local inflammation, terminating in its ordinary result, suppuration. They generally

arise from the irritation caused by a carious root, or a small loose splinter of the alveolar processes, occasioned by the careless extraction of a tooth. When thus produced, they are generally small, and often remain for years, healing and recurring, alternately, until the source of the irritation is removed.

They are frequently incidental on exposure to cold; and on some occasions seem to arise spontaneously, without any apparent cause. In these instances they are often very large, and productive of much suffering both local and constitutional. When neglected, they sometimes become extremely formidable, involving other parts of the mouth and face in the inflammation; and if this is not subdued before it terminates in suppuration, the matter is apt to force for itself an opening through the cheek, which is always difficult to heal, and often leaves an indelible scar.

I recently witnessed the case of a young lady who had experienced the most dreadful suffering, accompanied with frightful swelling of the face, from a large gum boil, produced by the irritation of an advancing wisdom tooth. The medical attendant had unfortunately neglected to ascertain the cause of the disease, until the matter forced its way through the cheek, and left a fistulous opening which weeks will not close.

TREATMENT.

The inflammation should be subdued, if possible, in its early stage, by the application of leeches; but if it cannot be prevented proceeding to suppuration, this termination of it ought to be accelerated by applying warm fomentations to the cheek.

As soon as the dull throbbing pain indicates that matter has been formed, an incision should be made into the tumor, for its evacuation. This is infinitely more effective than the common practice of puncturing, by which facility is afforded for the formation of fresh matter; although even this treatment will sometimes require to be several times repeated, and it may be necessary to touch the interior of the abscess with a slight solution of lunar caustic, to induce a more healthy action in the vessels, before the suppuration will cease.

OF TUMORS GROWING FROM THE GUMS.

Tumors frequently grow from the gums, and cause much annoyance by their size and irritability. They appear at first to be merely an enlargement or thickening of the membrane, usually produced by the irritation of a carious root; but they ultimately generally assume the form of a large rounded tumor, which is attached by one extremity to the gum by a narrow cervix, while the body of it remains loose in the mouth.

These excrescences are most frequently found growing from

the inner side of the under jaw, near its posterior extremity; and, by impeding the movements of the tongue, and their constant exposure to injury from the teeth, occasion so much inconvenience, that the individual is generally desirous for their removal.

This is most easily effected by means of a ligature, which may either be a single one, enclosing the neck of the tumor in a noose, or used as a double ligature, by passing two threads with a needle through the middle of the cervix, and tying one of them on each side. By either of these means, the circulation of the tumor will be stopped, and its body will generally drop off in the course of a few days.

This mode of destroying them is preferable to the use of the knife or the scissors, as these tumors are often exceedingly vascular, and, if they are removed by an incision, the hæmorrhage is generally severe, and difficult to arrest.

After the excrescences have been detached, it will be beneficial to touch the gum either with the lunar caustic, or a strong solution of it. This materially contributes to restore a healthy action to the vessels, and prevent the recurrence of the tumors, a tendency to which they frequently exhibit.

ABSORPTION OF THE SOCKETS, AND LOOSENING OF THE TEETH.

The absorption of the alveolar processes, and loosening of the teeth, is one of the natural consequences of the advances of age. It is not, however, always a criterion of this, as there are many instances of individuals having lost their teeth in this manner, who have not attained the meridian of life; and on the other hand, it is by no means uncommon to observe persons far advanced in years, whose teeth are firm, and their sockets in a state of preservation.

Premature absorption of the alveolar processes almost always arises from the undue stimulus which is given to the absorbent vessels, by such irritating agents as, the presence of tartar on the teeth, the effects of mercury, exposure to cold, &c. The teeth are also frequently expelled from their places by a singular process of deposition of osseous matter in the bottom of their sockets.— This generally occurs at the same time that the sides of these are in the act of being removed by absorption, and gives rise to that lengthened appearance of the teeth which is so often observed. The whole of these are frequently thus affected; in other instances only particular teeth become long. The latter circumstance is most apt to occur when the antagonist of the tooth in the opposite jaw has been lost.

It frequently happens that the new osseous matter, instead of being deposited in the bottom of the sockets, is found on their

sides, between them and the teeth. When this occurs, the teeth generally acquire a very irregular position, and are often widely separated from each other.

When the teeth have been removed by absorption, a great alteration is produced on the appearance of the face. The countenance seems shortened to the extent of nearly two inches. When the jaws approximate, the under one advances in front of the upper, and the chin thus appears to be parallel with the extremity of the nose, or occasionally to project beyond it. The lips fall in. The cheeks, deprived of their support below, appear prominent above, and sunk beneath; and we now observe the contracted visage, and all the striking features of age.

TREATMENT.

The treatment consists in the careful removal of any irritating cause. If tartar is present, the teeth should be effectually scaled, and the recurrence of it prevented as far as possible by the use of the tooth-brush, &c. If the irritation has been induced by the effects of mercury, the medicine should be discontinued, and some vegetable astringent lotion substituted. The teeth will thus soon again become firm, and the gums assume a healthy appearance.

It has been already mentioned, that when the teeth have become loose in consequence of external injury, as from blows, &c. they should be attached by a ligature to the adjoining uninjured ones, until they become firm. The same treatment may also with much advantage be followed, when the greater part, or the whole of the teeth, have become loose from absorption, or any of the other causes already enumerated. A silk ligature is to be placed around the most posterior tooth of one side of the mouth, and tied by a double knot on its anterior side, immediately beneath the gum. In this manner it is to be extended to the adjoining one, until the whole of the teeth are thus fastened to each other. The ligature thus applied will frequently remain for months, and retain the teeth in a state of comparative firmness. The practice is always highly conducive to the comfort of the patient, and will not occasion the slightest inconvenience, if performed with ordinary dexterity.

Empirical practitioners are constantly boasting in their advertisements of having discovered new and more effectual methods of fastening loose teeth. These assertions, like all those that proceed from the same quarter, will be found to be wholly delusive. There is no other mode of treatment than that which I have detailed; and the practice, instead of being a modern one, is at least as old as the era of John Hunter.

EFFECTS OF MERCURY UPON THE TEETH, &c.

Having so frequently alluded to the injurious consequences attending the use of mercury, it may be well to mention here its mischievous action on the teeth, gums, and mouth in general; on all of which the most destructive effects have been produced by the abuse of this powerful medicine.

In early life, the large and repeated doses of calomel that are so frequently administered to children, at the time that the formation of the permanent teeth is going on, either, by weakening the constitutional powers, prevent these from being properly developed; or, by stimulating the absorbent vessels, cause them to remove the enamel and the osseous substance, as soon as they are secreted by the arteries. It is thus that the teeth, on perforating the gums, are either observed to be evidently defective, or, if the injury be not externally apparent, their organization is yet so imperfect, that they begin to decay almost immediately afterwards. On other occasions, it may happen that no injurious consequences will be seen, until several years have elapsed, as the creative power, by which the teeth were formed, had been sufficiently energetic to develop them well, notwithstanding the weakening effects of the "specific." But the event is ultimately as certain; the teeth will eventually yield to a premature and rapid decay, unretarded by all the efforts of the individual to prevent it; and generally much to his surprise, as the source from which the malady sprung has been either overlooked or forgotten.

When mercury is administered at a more advanced period of life, and its exhibition "kept up" until the action of the medicine on the mouth affords a criterion of its introduction into the system, the mischief which it does is more strikingly seen. The absorption of the sockets goes on so rapidly, that the teeth are soon exposed to the extent of perhaps one half of their roots, and are rendered proportionally loose. Their periosteum becomes inflamed, and is liable to separate from the roots. The gums are detached from the teeth, and acquire a preternaturally red, swollen, and ulcerated appearance. They become highly charged with blood, and liable to profuse hæmorrhage from the slightest touch. The irritation is communicated to other parts of the mouth. The tongue is greatly increased in size, the interior of the cheeks and fauces are involved in the inflammation, which finally extends to the maxillary bones, and either induces mortification of them, or a tendency to this disease.

Formerly, when it was customary to administer mercury to such excess, as, in the hospital verbiage of that period, to make the unfortunate patients "spit their pint a-day," the total destruc-

tion of the teeth and sockets, and dreadful exfoliations of the maxillary bones, were ordinary occurrences. Happily the practice of violent and rapid salivation is now no longer countenanced, and if mercury is exhibited at all, the constitution is gradually brought under its influence; and the medicine being discontinued whenever a slight affection of the gums indicates that it has acted on the system, no injurious consequences will follow; but the patient, by means of a nourishing diet, and the use of astringent gargles, will soon recover, and the mouth again acquire a healthy appearance.

CHAPTER VIII.

DISEASES OF THE MAXILLARY BONES.

Diseases of the Maxillary Antrum—Abscess in it, arising from the closure of its Nasal Opening—Tumors in it, attached to Carious Roots—Imperfections of the Palate.

THE greater number of the diseases of the maxillary bones belong rather to the province of the surgeon than that of the dentist. Extensive exfoliations of the bone, caries, necrosis, &c. are strictly surgical cases; but affections of the antrum, and especially deficiencies of the palate, frequently fall under the notice of the dentist.

The antrum maxillare is the largest of that series of cavities which exist in the bones of the face and head. The use of these is hitherto unknown; some anatomists believing that, by affording extension to the branches of the olfactory nerves, they increase the power of the organ of smelling; and others, that they assist in modulating the tones of the voice. All of these cavities communicate with each other, either directly, or through the medium of the nostrils, into which small ducts from each of them extend. They are lined by a continuation of the pituitary membrane, which passes through the small foramina, and is extended on the parietes of the different sinus.

The Schneiderian membrane, and the continuation of it, which lines these cavities, are especially subject to that inflammation, to which all those of the mucous order are so liable. The maxillary sinus, from its situation, is more frequently affected than any of the others, and inflammation in it is more apt to affect the teeth and other parts of the face.

The most common affection of the antrum is the formation of

matter within its cavity. This is usually merely coagulated mucus, and not of a purulent description, as is generally supposed : for what now constitutes the abscess, was originally the ordinary discharge from the surface of the membrane ; the exit of which through the natural channel of the nostrils being prevented, in consequence of the inter-communicating opening being closed by the inflammation, the secretion had thus accumulated within the cavity, until it acquired a purulent appearance.

The lining membrane of the antrum is generally slightly affected, and the nasal opening of the cavity partially closed, on irritation of the nostrils from a common cold. The secretion is then accumulated within the cavity, and occasions a sensation of dull, deep-seated uneasiness, which must be familiar to every one, and usually subsides in a few days, on the re-opening of the channel, when the mucus again flows freely from the nostrils.

But if the inflammation has been severe, and continued so long as to lead to the complete closure of the foramen ; or, what is perhaps more frequently the cause of this becoming impervious, if the membrane has, from some innate tendency to disease, gradually thickened, until the opening has been obliterated, the symptoms and the suffering will rapidly increase. The dull oppressive pain is now accompanied by a throbbing sensation, or by acute paroxysms, extending along the face and forehead, in the direction of the frontal sinus. The teeth situated immediately underneath the cavity become exceedingly sensitive. The adjoining parts sympathize. The inflammation is extended to the face, giving rise to painful swelling of the cheek, which frequently increases to such an extent, as to lead to the complete closure of the eye, and produce a frightful deformity.

This enlargement is occasioned, not only by the inflammation of these parts, but frequently also by the expansion of the osseous sides of the antrum, which have yielded to the pressure of the matter within. These sometimes in this stage become carious and exfoliate, or are absorbed and give way. The matter is then discharged by an opening, either externally, through the cheek, or more frequently into the mouth, above the roots of the grinding teeth.

Inflammation of the antrum is also often occasioned by the irritation of diseased teeth. Those which are situated under the cavity, will, of course, most frequently produce it ; although sometimes it may arise from caries of a canine tooth, or of the small grinder adjoining to it. It will often altogether subside on the extraction of the carious tooth, and a considerable quantity of highly offensive matter, of a flocculent appearance, will frequently, at the same time, be discharged through the socket. In other

cases, the diseased action in the membrane will still continue, especially in those persons who are of a strumous constitution; the opening that has been made either remaining fistulous, or it may close up, and the nasal foramen again become pervious, and the matter may continue, for many years, to be discharged through either of the channels.

TREATMENT.

In the early stages of the inflammation, leeches should be applied for its reduction; and, if the symptoms are severe, the patient may be placed on the anti-phlogistic regimen. The mouth should be examined, and if any carious teeth or roots are found, which, from their situation, are likely to be a source of irritation, they should be immediately extracted. If, notwithstanding these measures, the opening into the nostrils still remains impervious, and the increase of the secretion assumes a formidable appearance, an opening must be made for its discharge.

This is readily made through the sockets of any of the teeth which are situated below the antrum. If any of the posterior teeth is in a carious state, it will, of course, be selected for removal. But in instances where the whole of them are sound, the posterior bicuspidatus is the one best adapted for the purpose, as it is invariably situated under the most depending part of the cavity, and its situation in the mouth readily admits of the application of a straight three-sided trochar, with which the perforation is to be made.

On the extraction of the tooth, the trochar is to be introduced into the socket, and advanced by a rotary motion, until the floor of the antrum is perforated; when the evacuation of the matter will immediately follow. Care must be taken that the instrument, on entering the cavity, is not suddenly carried to its opposite extremity, and the orbit thus endangered by the awkwardness of the operator, or the restlessness of the patient.*

When the matter is evacuated, the cavity should be syringed with tepid water, to which a little port wine may be added. Frequently the operation will require to be several times repeated, in consequence of the accumulation of the secretion recurring.

* Mr. Liston, one of the highest authorities on operations of which this country can boast, I believe, recommends that the opening should be made directly into the cavity, through the alveolar process, immediately above the roots of the teeth. Either mode will answer equally well; but the one mentioned in the text, is in general preferable, as the teeth are usually in such a carious condition, that they require to be removed; and their fangs frequently project into this cavity, and will thus, on their extraction, sometimes leave a natural opening for the discharge of the secretion.

In these instances, an injection of solution of sulphate of zinc, or the sulphate of copper in rose water, in the proportion of three grains of the former, or two of the latter to one ounce of water, may be used for promoting a more healthy tone in the secreting vessels. The surface of the membrane frequently becomes so callous, that the strength of the injection requires to be greatly increased, or undiluted port wine may be used with advantage.

TUMORS IN THE ANTRUM ATTACHED TO THE ROOTS OF THE TEETH.

Tumors are sometimes formed within this cavity, and give rise to much uneasiness. They are most commonly attached to the roots of any of the teeth that extend into the antrum, and have the appearance of a membranous sac, filled with purulent matter. This sac seems to be a production or elongation of the membrane which surrounds the roots of the teeth; to which it in most cases firmly adheres, but usually remains loose within the cavity.

These tumors or abscesses appear to be produced by the irritation of carious roots; on the extraction of which, they are generally found adhering to their extremities. The capsule which encloses the matter, admits of great elongation, as it is by no means unfrequent to remove in this way a tumor containing a large quantity of pus, through the small opening by which the fang of the tooth had extended into the antrum.

The tumors of a cancerous or fungus hæmatodes nature, to which this cavity is subject, are strictly surgical cases, and are unfortunately almost always incurable; as they, in most instances, re-appear after extirpation. They invariably give rise to great deformity, and agonizing suffering, to which little or no relief can be given, and ultimately terminate in the anticipated death of the exhausted sufferer.

IMPERFECTIONS OF THE PALATE.

Deficiencies of the palate are sometimes the result of partial caries of the maxillary and palatal bones in the adult, but more frequently they exist from the period of birth. In the former instance, the imperfection is usually a circumscribed opening in the roof of the mouth, and is, in most cases, confined to the palatal processes of the maxillary bones; but when the case is congenital, an extensive fissure will generally be found extending along the whole course of the soft as well as the osseous palate, from the uvula to the upper lip, both of which are frequently in the same way affected, thus also producing cleft uvula and hare lip.

The annoyance occasioned by the smallest deficiency of the

palate is exceedingly great. The serious imperfection of the speech, the difficulty in articulating, the frequent passage of the food from the cavity of the mouth to that of the nostrils, are sources of constant affliction. In early life it deprives the child of its proper nutrition, as the preternatural communication between the mouth and nostrils prevents the formation of that perfect vacuum which is requisite for the due performance of sucking, and the child must be supported by external aliment, which is ill adapted for the delicate state of the digestive organs at this period.

TREATMENT.

(Congenital Imperfection.) If the fissure is narrow, an attempt may be made to unite its sides at a very early period, and will often be attended with success. All that is necessary, is merely to scarify the edges of the opening, and apply a little of the sulphate of copper, or of nitrate of silver, for the purpose of inducing a slight inflammation. Granulations being thus produced, the sides of the opening approximate, and whenever they meet at the smallest points, union of the whole will rapidly follow.

But when the imperfection is extensive, and accompanied with hare lip, a more serious operation will be required. It then becomes necessary to bring the sides of the fissure together by means of ligatures; and it will in general be requisite to postpone the treatment for several years, until the patient has acquired sufficient fortitude to enable him to submit to the operation with that steadiness on which the success of it so much depends. The operation for the cure of hare lip may be performed a considerable time before that on the palate is attempted, as it not only facilitates the operations, to perform them separately, but the contraction produced by the cicatrix of the lip may serve to bring the sides of the palatal fissure nearer to each other, or at least prevent their farther separation.

In deficiencies of the palate arising from caries of the bones, or in congenital imperfection, when the opening is very extensive, no benefit will be derived from any surgical operation; and it will be necessary to have recourse to another mode of supplying the loss of substance. With this view, what are called artificial palates have been devised.

These may be formed either of gold or of bone; the former, however, is generally preferable. Silver should never be used for this purpose, as it invariably undergoes oxydation in the mouth, and frequently proves injurious from this cause.

It is impossible to give any general directions for the construction of these palates, which could be followed with advantage in

any individual case. The form of the mouth, and the different peculiarities of it, are subject to such incessant variety, that the mode of treatment which would be favorable in one instance, might be highly inapplicable in another. It may, however, be mentioned, that, both in constructing and applying them, the practitioner ought to keep in view the prospect of a natural cure, or at all events, of a diminution of the opening, and study to promote any tendency of this nature as far as possible. The artificial palates should therefore always be attached to the teeth, and should never be fastened by metallic springs, or by folding down wings, reclining on the floor of the nostrils, (as in the ingenious contrivance of Mr. Weiss,) as by the constant pressure which these exert, the delicate, spongy bones may be injured, and the opening will invariably be enlarged.

An artificial palate, when successfully constructed, is deservedly considered as one of the most beneficial operations which the dentist can perform. It will be productive of the greatest advantage to the patient, and enable him to articulate, always with considerable, often with perfect distinctness; and will materially remove the evidence of an affliction which is equally distressing to the subject of it, and to the observer.

CHAPTER IX.

OF NEURALGIA, OR TIC DOULOUREUX.

ALTHOUGH this affection more properly falls under the notice of the physician than that of either the surgeon or the dentist, yet it will be proper to mention it before concluding the subject of the diseases of the teeth, with which it is so frequently connected.

The disease, to which the names of neuralgia and tic douloureux have been applied, arises from some peculiar and mysterious affection of the nerves. The whole of these appear to be subject to it, as it is occasionally observed in different parts of the body; but the branches of the fifth and seventh pairs of nerves, which are distributed to the muscles of the face, are most frequently affected.

The origin of this disease is involved in the greatest obscurity, and very little is hitherto known of it. By some authors, it has been supposed to proceed from derangement of the digestive functions; while others believe that it arises from pressure on the nerve. This latter opinion is considered to be corroborated by the more recent discoveries of Sir Henry Hallford, who, with that minute observation for which he is so distinguished, remarked a peculiar amygdaloid thickening of the inner table of the

skull, in several instances in which the individuals had been subject to this disease. But neither of these explanations will account for the peculiarities which tic douloureux exhibits. For if the disease arose from derangement of the digestive organs, the whole of the nerves, it may be imagined, would be equally affected by it, and especially the great sympathetic nerve, and those which are more immediately connected with the abdominal viscera; and yet these rarely become the subjects of neuralgia. On the other hand, if it be produced by pressure, and particularly that which is occasioned by the thickening of the inner table of the cranium, the whole of the cerebral nerves would be equally subject to it; nor would this account for the circumstance of the disease occasionally appearing in those parts which are more remotely connected with the head, as in the arm, or in the heel, as recorded by Mr. Bell. The latter theory, however, is undoubtedly the most probable, and is confirmed by the fact, that all the symptoms of tic douloureux are frequently produced by the pressure on the nerve, which has been occasioned by the improper stuffing of a tooth.

But the most extraordinary feature of tic douloureux is, that, notwithstanding the dreadful suffering it gives rise to—which may be said to be the most acute to which the human frame is liable,—not the slightest appearance of disease can be observed in the affected nerve. There is here no trace of any of those marks of inflammation which are observed in other structures of the body when excited, or in the nerves themselves in cases of tetanus or locked-jaw. On dissection of those who have suffered from neuralgia, no morbid indication can be seen in the nerve which was the subject of the irritation; but, on the contrary, it seems to have been equally healthy with any of the others, and presents exactly the same appearance. This circumstance, it must be admitted, is adverse to the supposition of the disease being produced by pressure on the nerve, which, it may be inferred, would leave some inflammatory trace; and shews that tic douloureux originates from a source which is so subtle, that it has as yet escaped our observation.

In those cases, however, of what may be termed local neuralgia, or an affection exceedingly analogous to it, arising from the irritation produced by the improper stuffing of a tooth, when the gold, or artificial substitute presses on the nerve, the ordinary marks of inflammation are observed both in the excited nerve, and the sheath in which it is enclosed.

In describing the symptoms of tic douloureux, I shall mention those that usually occur, when the sub-orbital nerve, the most frequent seat of the disease, is affected.

The pain is altogether *sui generis*, and far exceeds in intensity that of any other disease. It appears to proceed chiefly from

the small grinding teeth, and extends along the course of the branches of the nerve in the face, shooting high into the temple, in the direction of the ear. The branches of the inferior maxillary nerve are either at the same time affected, or sympathize with those of the sub-orbitary; as the same sensation is generally experienced in the teeth of the under jaw, extending down the neck as far as the arm, to which it is also sometimes communicated. The pain, in some cases, occurs in paroxysms, and is periodical in its attacks; in others, it is incessant, or the interval is not so distinctly marked. While the paroxysm lasts, the suffering is of the most acute description; but when over, a period of comparative relief succeeds, and frequently the pain subsides altogether, until the recurrence of the paroxysm, which is often observed to return daily at regular periods. In those instances in which the paroxysm is not so strikingly indicated, the pain is more constant, and frequently equally great. In all cases, the digestive organs are generally much deranged.

In some persons there seems to exist a constitutional tendency to tic douloureux, which will readily be brought into action by certain exciting causes. This disease appears to be materially influenced by the state of the mind, and is often accelerated or occasioned by severe mental affections. It is especially apt to occur during periods of great anxiety, or long and intense depression, incidental on grief, misfortune, or disappointed hope. Or if the disease had previously existed, it will always be increased by these affections, and can seldom be alleviated while the mental disquietude remains undiminished.

TREATMENT.

Many remedies have been proposed for the alleviation of this dreadful disease, and almost all of them have been found to fail. The carbonate of iron, suggested by Mr. Copeland Hutcheson, was formerly considered a specific; but, in many cases, it has been productive of little benefit, and in all, its exhibition is attended with this disadvantage, that the medicine requires to be increased in quantity, in every successive administration, until at last so large a dose is requisite, that it materially disturbs the functions of digestion.

From the circumstance of the disease generally assuming an intermittent character, the exhibition of bark was naturally suggested; and it has in many instances been highly beneficial, especially under the form of sulphate of quinine; doses of which, to the extent of three grains, repeated several times a-day, are often productive of the greatest advantage.

The exhibition of arsenic, in the form of the solution, has been

proposed with the same view, and several instances of its success are recorded. But the alarming constitutional excitement which this powerful agent so invariably occasions, must in a great measure prevent it ever being generally used.

The principle of counter irritation has been resorted to with considerable success in the treatment of tic douloureux. The oxymuriate of mercury is most commonly used for this purpose. It is applied to the cheek in the form of an ointment, composed of from one to two drachms of the oxymuriate to one ounce of common cerate. A great disadvantage, however, attends its use,—it is always productive of much deformity. The moxa and issue have long been beneficially employed in cases of neuralgia affecting the loins and other parts of the body.

The division of the excited nerve, as suggested and accomplished by Sir Astley Cooper, is another mode of local treatment of tic douloureux. A similar operation has for a long time been performed with success, by veterinary surgeons, for the cure of an affection of this nature in the horse, and in Sir Astley's case, the division of the sub-orbitary branch afforded the anticipated relief. It has been equally successful in several subsequent instances, when re-union of the divided nerve has not followed. But when the divided extremities of the nerve again unite, the symptoms of the disease have been generally found to recur. This event may, however, be readily prevented by removing a small portion of the nerve, instead of merely cutting it across. In both cases, however, the operation is attended with the unfortunate result of producing total paralysis of that side of the face on which the nerve is divided.

As this disease is always attended with more or less derangement of the digestive functions, it will be necessary to bring these into more regular order, before any cure can be effected. With this view, a slight course of alterative and cathartic medicines may be prescribed.

The cathartic pills with calomel, of the late Mr. Abernethy, are well adapted for the purpose; and a small proportion of opium, hyosciamus, or some similar anodyne, may be added, to tranquillize the nervous excitement.

If any mental disquietude exists, every effort should be made to suppress or alleviate it. The patient ought to be prevailed on to mingle with society, or, what is perhaps preferable, have recourse to a change of scene. Travelling is thus highly beneficial, and the symptoms of the disease will often be much ameliorated by a tour.

In those instances of local neuralgia which are produced by the improper stuffing of a tooth, at a time when the nerve is exposed and subjected to the pressure of the gold, and which are

so often occasioned by the empirical practice of "plugging" teeth, when in a state of the highest excitement, with what are termed "anodyne or mineral cements," composed of the coarsest metals, no relief will be derived from any other treatment excepting the extraction of the tooth ; and in every instance the sooner that this is effected the better. In those cases in which symptoms, resembling those of tic douloureux, arise from exostosis of the teeth, or from the irritation of a carious root, the same course must be followed.

PART III.

OPERATIONS ON THE TEETH.

WHILE describing the different diseases of the teeth, I mentioned various operations that were requisite for their cure. I did not think it necessary to interrupt the course of the description, for the purpose of then detailing the mode in which these are performed; conceiving, that for the convenience of reference, it would be better to comprehend them in a different part of the work. I shall now, therefore, proceed briefly to notice them.

I may be permitted to premise, that, in performing these operations, the fewer instruments that are used the better; and that no unnecessary exhibition of them should ever be made. I am aware that this recommendation is diametrically opposed to the practice of all the empirical, and but too many of the respectable portion of the profession; but yet I believe, that although such ostentatious parade, on the part of the operator, may, in a few instances, startle the timid and bewilder the ignorant, it will only excite the merited ridicule and contempt of the great majority of his patients.

CHAPTER I.

SCALING AND CLEANING THE TEETH.

1. THESE are the operations required for the removal of the tartar, or any other foreign body, which may have collected upon the teeth; and however easy of performance they may at first appear, no one but a regularly educated practitioner ought ever to be allowed to undertake them; as the advantage to be derived from them, and the permanency of the teeth, in a great measure depend on the mode in which the operations have been performed.

2. It has been already stated, that the tartar, when first deposited on the teeth, is so soft, and adheres so slightly, that the friction produced by the motion of the tongue, or of a common tooth brush, would be sufficient to remove it. But the position of the

teeth, in some parts of the mouth, prevents either from being effectually applied, or even touching a considerable portion of their surface. We thus constantly observe tartar accumulated, in a greater or less degree, in almost every individual, on the sides and posterior part of the incisors, canines, and small grinders of the under jaw, and on the outer surface of the molares of the upper; on all of which it has the greatest tendency to be formed, not only in consequence of a great part of their surfaces being beyond the reach of the tongue, but also owing to their immediate location to the principal reservoirs of the saliva.

3. When the smallest quantity of tartar adheres to the teeth, it rapidly becomes hard, and forms a nucleus for future deposition. This, if not prevented, will frequently increase, until several of them are completely covered, or enveloped in a mass of the secretion. The gums are kept in a state of constant irritation by the presence of the calcareous body. The sockets are absorbed, and the teeth, being thus as it were undermined, will inevitably be lost, unless the tartar is removed.

4. The instruments by which its removal is accomplished, are termed scalers. They are of various forms, adapted to the respective aspects and position of the different teeth.

5. These instruments, it should be observed, are not intended to scrape down the tartar, which has now become so hard, that any attempt of this kind would be vain. The mode of using them is to apply the edge of the instrument to the free part of the tooth, underneath the calcareous deposit, or between it and the gums; when, by a slight effort, the tartar will readily be started off in scales from the surface. It will facilitate the operation, to remove the concretion completely from one tooth before commencing with another, and care should be taken that the whole of it is scaled off, for if the smallest particle is allowed to remain, it will irritate the tongue and gums still more than before the operation, and contribute to a future formation.

6. Frequently the tartar is collected in such quantities, as to afford an adventitious support to the teeth. In these cases, the removal of the whole of it ought not to be attempted at one operation, but may be beneficially effected at several subsequent periods, an interval of a few days being allowed to elapse between each attempt.

7. After the removal of the tartar, the surfaces of the teeth generally feel rough to the tongue, and an unpleasant feeling of compression is experienced by the patient, in consequence of minute particles of the substance remaining between the sides of the teeth. The former of these annoyances may be removed by slightly rubbing the surfaces of the teeth with a cane and a powder consisting of equal parts of pulverized pumice-stone and le-

vigated chalk; and the sensation of compression will be diminished by passing a common spring tooth-pick between them.

8. The gums usually feel tender on exposure to the air after removal of the tartar. This slight uneasiness always subsides in the course of a few days; and may be alleviated by washing the mouth with any of the following lotions:

R Tinct. Myrrh, ℥ vi.
Mistur. Camphorat. ℥ viij. M.

R Tinct. Cinchonæ, ℥ ss.
Vini Rubri Lusitan.
Aq. Fontis ā ā ℥ iij. M.

R Tinct. Myrrh, ℥ vi.
— Cinchon. ℥ ss.
Infus. Rosar. ℥ iv.
Aq. Fontis, ℥ vi. M.

9. That peculiar dark colored incrustation, which is so often observed on teeth that have been neglected, especially on those of youth, adheres with so much tenacity, that it cannot be scraped off with an instrument without the risk of injuring the enamel. The only safe mode of removing it, is by the patient use of the cane and pumice-stone powder, or the teeth may be cautiously rubbed with a piece of the pumice-stone itself.

10. When the tartar has been removed, and the teeth restored to their natural color, their preservation in this condition may be greatly maintained by attention to the use of the tooth-brush, and some innocuous powder, that will act slightly on the teeth by a gentle friction.

11. The chalk and pumice-stone powder already mentioned is far too powerful for frequent application. The tooth powders that are to be daily used, should consist of some impalpable substance, that will neither act chemically upon the structure of the teeth, nor too powerfully on their surfaces by friction.

12. Charcoal and camphor, orris root and levigated chalk, bark and finely pulverized cuttle fish—all answer the purpose equally well, and are the substances of which most tooth powders consist; some of the fragrant essential oils being usually added, to render them more agreeable. All those powders that are recommended for the purpose of rendering the teeth white, should be sedulously avoided, as they can only produce this effect by acting chemically upon the enamel and destroying its structure.

13. It may here be observed, that in cleaning the teeth, no attempt should ever be made to render them whiter than they naturally are. All those substances that produce this effect, can only do so by their acidity; and it has already been mentioned how in-

juriously the acids act upon the teeth,—at first rendering them preternaturally white, but in a short time more discolored than before, and ultimately so sensitive and irritable that they are a source of annoyance to the patient as long as they remain in the mouth.

14. With regard to tooth-brushes, they should neither be too hard nor too soft, as the former act too powerfully on the teeth, and irritate the gums, and little or no benefit will be derived from the latter. Those that are intermediate between either extreme, and whose bristles are considerably apart from each other, are of the most advantageous form.

15. Notwithstanding all the efforts of the individual, the tartar often, from some peculiar tendency, collects so rapidly, that it becomes necessary to scale the teeth every two or three months, and, it will always greatly contribute to their permanency, to have the tartar removed from them at least once a year.

CHAPTER II.

OF STUFFING THE TEETH.

With Remarks on the Poisonous Properties of the "Anodyne and Mineral Pastes" used for this purpose.

16. THIS operation consists in filling up, by artificial means, the cavity which caries has produced in a tooth, and if properly performed, it is one of the most beneficial which the dentist can achieve, as the decay may often be thus arrested in its progress, and the preservation of the tooth prolonged for years.

17. The success attending the operation depends on several circumstances,—as, the nature of the foreign body by which the cavity is filled, the favorable condition of the tooth, the entire removal of the carious part, and the complete exclusion of the air and saliva from the interior of the cavity.

18. A great variety of substances have been used for stuffing teeth; and empirical practitioners are daily announcing the discovery of new ones, and publishing glowing descriptions of the "wonderful efficacy" of their nostrums, although in reality every one of them is generally infinitely worse than those which preceded it.

19. Of all the materials that have been employed for this purpose, gold leaf, the most ancient, is still incomparably the best, as it is not only the purest of all the metals, but is possessed of the highly valuable property of undergoing no change in the mouth, where almost every other metallic substance is affected.

Platina the more recently discovered metal, and inferior only to gold, it is true, forms an exception to this remark; but it is rarely to be found in a state of purity, and is even then possessed of much less ductility than gold is.

20. All the other metals are more or less objectionable. Silver and tin rapidly undergo oxydation on exposure to the air and saliva. Lead is still more improper, as it is readily decomposed by the saliva, and many fluids in ordinary use for culinary purposes, such as vinegar, &c.; and, when thus carried into the stomach, it may prove dangerous in the highest degree.

21. Notwithstanding the well known deleterious effects of lead, it is constantly employed by empirical practitioners in the composition of what they advertise as "anodyne cements" and "mineral pastes." These generally consists of oxydes of lead in union with mercury, or of cobalt with plaster of Paris; the compound thus formed being at first soft, but soon becoming hard on exposure to the air and moisture of the mouth.

22. Laying their poisonous tendency altogether out of the question, the mode in which these wretched farragoes are applied, renders it impossible that they can ever be productive of the smallest benefit. The persons who use them rarely take the trouble of removing the carious part of the tooth, but, on the contrary, boast that they cover it up with their nostrum. The unscientific nature of this practice will at once be obvious; as it is well known that if the smallest particle of the decayed part is left, the source of contamination still remains, and the disease will go on in the interior of the tooth as rapidly as ever.

23. Another mode of stuffing teeth was proposed several years before; indeed, I believe as long ago as the time of the late Mr. Fox. The material used was a composition formed by the union of tin with several similar metals. The compound thus made becomes fusible at a considerably lower temperature than any of the metals that compose it. A small piece of it being placed in the cavity of the tooth, is readily melted by the application of a heated iron wire.

24. The practice, I believe, has now been discontinued, although it is far less reprehensible, and infinitely more effective, than the empirical one that has been substituted for it. The chief objections to its use are, 1st, The irritation in the tooth which the application of the heat frequently produces; 2d, The contraction which takes place in the metal on cooling, by which it generally happens, that the cavity is not so completely filled up as to exclude the air and saliva from the interior of the tooth; and, 3d, The limited practicability of the operation, even if it were invariably successful, as the power of gravitation will prevent it being applied to any of the teeth excepting a few of those in the under jaw.

25. A tooth is in the most favorable condition for being stuffed at the time when a dark colored spot in the enamel indicates that caries has commenced in the osseous structure beneath, although it has not yet made an opening externally, nor advanced so far internally, as to have exposed the canal of the tooth. In this early stage, the cavity can always be filled up with the greatest advantage, and generally without the least pain to the patient, as the sound plate of bone interposed between the canal and the carious part completely prevents the pressure of the gold affecting the nerve.

26. The first part of the operation of stuffing consists in removing all the decayed part of the tooth, by means of broaches of a triangular or pentagonal form; or, if the situation of the caries will not permit of the application of these, excavating instruments must be used for the purpose of cutting it way. These instruments, of course, must be of different forms, adapted to the various aspects which carious teeth present, and should consist of two sets, one of which is required for applying to the right side of the opening, and the other for the left.

27. In excavating the cavity, although it is necessary to clear away the whole of the diseased structure—and it is desirable to make the interior of the opening as equal as possible—yet it should be the study of the operator to avoid removing any of the sound part of the tooth, with the view of rendering the space wider beneath than it is at the surface. I am aware that this recommendation is contrary to the practice of almost every dentist, and that many authors (among whom I am surprised to find so scientific a man as Mr. Bell) even inculcate the propriety of making the cavity larger below than at its orifice, for the purpose, as they state, of more effectually securing the gold. I am convinced that the result of this practice is generally the reverse of what they anticipate, and believe it to be utterly impossible, that a cavity, which is wider in the interior than at the surface, can ever be so accurately filled up by the introduction of a solid body, as a cylindrical opening will be. In the former instance, it will frequently happen that the gold fills the space so inadequately, that, although it will not be apt to fall out, it soon becomes loose, and moves about; of course admitting of the entrance of the air and saliva into the interior of the tooth, and thus destroying the whole effect of the operation.

28. When the cavity has been duly prepared, it is to be thoroughly cleared of all moisture and extraneous matter by wiping it out with a little cotton lint wrapped round a small probe, or on the point of one of the excavating instruments. On the removal of this lint, the gold leaf is to be immediately inserted, and placed in contact with the extremity of the cavity. The

rest of it is to be gradually introduced, and equally pressed down, until the whole of the space is accurately filled, when the superfluous metal is to be cut away, and the surface of it polished with the burnishing instrument.

29. Care must be taken not to introduce too much of the gold at once, as the orifice of the opening may thus be blocked up, and the space beneath it left vacant. If this should occur, the effect of the operation is rendered useless, and the stuffing will soon fall out.

30. It should be the aim of the operator to have the whole of the metal inserted in one continuous piece, as it has then a much better chance of remaining firm, than if several detached fragments have been introduced.

31. In most cases, the gold leaf which is in common use for this purpose, is sufficient; but when the opening is large, a thicker sheet may with advantage be substituted. The metal should previously be thoroughly softened, by placing it on a plate of iron heated to redness, to give it the requisite ductility; and the leaf should be lightly rolled up before being introduced into the tooth.

32. In filling up the cavity of a carious tooth, the greatest care must be taken that the artificial body never comes in contact with the nerve. If this precaution is neglected, and the practitioner has the rashness and cruelty to persist in pressing down the metal, notwithstanding the writhing agony of his patient, the most dreadful suffering will inevitably follow. The pain thus produced is so exquisitely acute, that it has frequently been mistaken for that of *tic douloureux*, and this kind of irritation has often given rise to symptoms resembling those of that fearful disease. In these unfortunate cases, the immediate extraction of the tooth is the only way of affording relief; as the mere removal of the gold will not be sufficient to allay the irritation which the pressure of it occasioned.

33. The practitioner must also beware of attempting to stuff a tooth while its nerve is in a state of excitement, as the only effect of the operation then, will be to increase the pain in a tenfold degree. If the irritation is severe, it is infinitely better to extract the tooth at once, than to resort to dilatory and generally useless measures, for the purpose of allaying the pain, with the intention of afterwards filling up the cavity. Indeed, the patient will generally insist on having the tooth removed.

34. In those cases in which the pain is more moderate, and where it is an object of importance to preserve some particular tooth, recourse may be had to those means which were formerly mentioned as occasionally useful in alleviating toothache; and whenever the irritation has subsided, the cavity may be permanently filled up.

35. Before concluding, I have only to remark, that although it is impossible to predict that success will invariably attend the operation of filling up of the cavity, yet if it has been adequately performed, and in favorable circumstances, the patient may, in the great majority of cases, anticipate a beneficial result. Instances are by no means unfrequent in which teeth have been in this way preserved for many years; and several well authenticated cases are on record of their remaining thus in the mouth for upwards of a quarter of a century, without undergoing farther decay.

CHAPTER III.

1. *Of Filing the Teeth.*—2. *Of Tying the Teeth.*—3. *Of Cauterizing the Nerve—Disadvantages of the Actual and Potential Cauteries—Preferable Mode of Destroying the Nerve.*—4. *Scarification of the Gums.*

OF FILING THE TEETH.

36. THE cavity produced by caries is sometimes so superficial that it will not admit of being filled up by artificial means. This is especially observed when the disease commences on the sides of the upper incisors, in consequence of the pressure which the teeth exert on each other. In this instance, the decay invariably goes on with great rapidity, if means are not taken to prevent the carious portion affecting the sound part of the tooth beneath it.

37. The form and conspicuous situation of these teeth will rarely permit of their being adequately stuffed; and indeed the extensive surface which the caries, in such a case, usually presents, will almost always prevent the operation being properly performed. It therefore becomes necessary to remove the affected part with the file, as the only mode of retarding the advance of the disease.

38. Considerable portions of the teeth may thus be cut away, without endangering their vitality, or impairing their external appearance, if the instrument has been dexterously used. In the first stage of the disease, the operation requires but little ingenuity, as it is merely necessary to make a small space, by passing a smooth file between the teeth. But when the caries is more extensive, considerable care is requisite to effect the removal of the diseased part without materially altering the outward aspect of the tooth.

39. The files used for this purpose should be perfectly smooth on one of their surfaces, so that, when passed between the teeth,

they may cut away the posterior part of the affected tooth, without injuring the front of the adjoining sound one.

40. It should be the object of the operator to make the sides of the space as smooth and equal as possible, that it may not readily entangle the particles of the food; and care must be taken by the patient to keep it in a state of purity. A small brush, formed by a single row of bristles, will be found useful for this purpose; and a little cotton lint, moistened with the camphorated spirits of wine, may be occasionally applied with advantage.

OF TYING THE TEETH.

41. The application of a ligature to the teeth, is frequently productive of the greatest advantage, when their stability has been impaired by the effects of a course of mercury, or they have become loose in consequence of the natural absorption of the sockets from age. In those cases also in which the teeth have been displaced by external violence, either accidentally by a blow, or culpably by the careless extraction of an adjoining tooth, it becomes necessary to tie them to the adjacent firm ones, until they re-adhere to the sockets.

42. The material employed for this purpose, is a thin silk cord, known by the name of "dentist's twist." It is preferable to the common gut, or Indian weed, which were formerly used.

43. The only attention requisite in the application of the ligature, is to place the knot in such a situation that it may not interfere with the motions of the tongue or lips. This becomes an object of considerable importance in tying the teeth, when several, or the whole of them, are loose, and the ligature is to remain for a length of time.

44. The mode of proceeding is, to enclose the neck of the posterior tooth in the cord, which is to be fastened by a double, or, what is infinitely preferable, a sailor's knot, on the anterior side of the tooth. The ligature is to be extended in the same way to the rest of the teeth, until the whole of them are enclosed. The knot being thus placed between the sides of the teeth, no inconvenience will be occasioned by its presence.

45. Trifling as this slight operation appears, it is always highly conducive to the comfort of the patient, as the teeth will thus be rendered comparatively firm, and retained for a considerably longer period than they otherwise would have been.

OF DESTROYING THE NERVE.

Inadequacy of the Actual and Potential Cauteries—Preferable Mode of Performing the Operation.

46. It frequently happens, that the practitioner is under the necessity of effecting the destruction of the nerve, when it has been

exposed by caries, or in fractures of the teeth by external violence. The operation is especially called for in the instance of the upper incisors and canines, when it becomes an object of importance to retain the roots, for the purpose of pivoting other teeth upon them. In all other cases of exposure of the nerve, by fracture or by caries, it is infinitely less painful, and a much more scientific practice, to extract the roots at once, than to make any attempt to allay the irritation by destroying the nerve.

47. The destruction of the nerve is usually accomplished either by the actual or by the potential cautery; but it may be much more easily effected by the mode which I shall afterwards mention.

48. The actual cautery has, in this country, been justly banished from almost every surgical operation, and is now, I believe, only retained for destroying the nerves of the teeth, and as a mode of stopping hæmorrhage from wounds of the tongue. Whether it may be necessary in the latter instance or not, it is for others to determine; but as far as the teeth are concerned, it may well be dispensed with.

49. The objections to its use are its formidable and barbarous appearance, and, in most cases, its total inadequacy. The latter, it has been already stated, is caused by the smallness and the tortuous course of the dental canals, which render it difficult to introduce the cauterizing instrument into them; and even if this should be readily accomplished, its temperature is generally so diminished by the time that it is inserted, that it is inadequate to effect the instant destruction of the nerve on coming in contact with it, and the ineffectual attempt only increases the irritation.

50. When it is necessary to attempt to destroy the nerve by means of caustics, (a practice, to say the least of it, of exceedingly doubtful expediency,) the nitrate of silver is best adapted for the purpose. It may be used, either by placing a small piece of it within the opening in the tooth, or by applying it with a hair pencil in a state of strong solution. The cavity should be wiped out, if practicable, with a little cotton lint, before the caustic is applied; and care must be taken to prevent the salt diffusing and injuring the adjoining parts. It will be observed, that the application of the potential cautery is confined to the teeth of the under jaw, and that the principle of gravitation will prevent it from being employed in the instance of the upper.

51. An infinitely more effectual, and far less painful mode of destroying the nerve, is to crush it at once by the introduction of a small trocar, or a common broach. It is surprising that this simple and efficacious plan should not have been suggested before. The pain attending the operation is but momentary, as the nerve is wholly destroyed by a single turn of the instrument.

SCARIFYING THE GUMS.

52. The mode of scarifying the gums of children, and the benefit which results from the practice, have already been mentioned, while describing the treatment necessary for alleviating the dangerous symptoms of the first dentition. The operation merely consists in making a semi-lunar, or two crucial incisions over the distended part, with a gum lancet. A small fleam-shaped instrument is best adapted for the purpose, and it should always be carried to such a depth, as to meet the crown of the tooth beneath.

53. It is occasionally of much benefit to remove, at the same time, a small portion of the gum, with a pair of scissors, especially in those cases of severe irritation of it, occasioned by the advance of the wisdom teeth.

54. When it is necessary to scarify the gums, in consequence of their being in a spongy state, and overcharged with blood, the incisions should be made in a perpendicular direction, between the roots of the teeth. The vessels are thus not only more effectually divided, but the contraction of the wound, when its sides unite, assists in removing the tumidity of the gum.

55. The common practice of cutting the gum with a lancet, preparatory to extracting the teeth, ought never to be followed. It is, in every instance, an unnecessary infliction of pain on the patient, and an obstruction to the operator himself, as the bleeding prevents him observing whether the instrument is adequately placed upon the tooth.

56. If it is considered requisite to separate the gum, before attempting extraction, an instrument similar to a *tenaculum* should be used for the purpose; but the practice is almost always unnecessary, as the force that is sufficient to withdraw a tooth from its socket, will readily sever the comparatively slight attachment which subsists between it and the gum.

CHAPTER IV.

EXTRACTION OF THE TEETH.

THIS operation is the oldest of all that have been performed on the teeth, and is perhaps one of the most ancient of any in the practice of surgery. It can also boast of having proved attractive to a far greater variety of "operators," than any other upon record; all classes, from the embryo apothecary to the blacksmith and the barber, having occasionally attempted it, and contended for its monopoly. The advance of refinement, and the division

of labor, have gradually caused the two last amateur practitioners to relinquish their claims, and retire from the field ; but their departure has not been attended with loss to the community at large, as the majority of the *soi-disant* "surgeon-dentists" of the day are eminently qualified to occupy their places,—the former pursuits of many of whom, before their professional metamorphosis, having been still more unqualifying than either those of the blacksmith or of the barber were.

The difference between the practice of such persons and that of the surgically educated practitioner, will readily be discovered by the result. The former, indeed, will, by mere force, and the rashness which ignorance inspires, often "pull out" a tooth, without any serious injury to the patient ; although severe contusion and laceration of the gums, extensive splintering of the alveolar processes, and the removal of unaffected teeth, are more frequently the results of their violence ; while the latter, by his anatomical knowledge of the parts, is enabled to perform the operation with infinitely less pain to the individual, and without any of these unfortunate occurrences.

57. The instruments that are required for performing extraction, are the tooth-key, the forceps, and elevator, or punch. An endless variety of form and modification of these instruments are to be found, almost every dentist having conceived it to be necessary to invent something of his own, and in numerous instances been influenced by the vanity of attaching his name to what he thinks proper to term "improvements," which, in nine cases out of ten, will be considered to be the reverse, by every one excepting himself.

58. The tooth-key is an old invention, or rather a modification of the ancient and obsolete instrument known by the name of the "paces ;" and although it is now the fashion to despise and abuse it, (especially with those persons, as Mr. Bell well remarks, who secretly resort to its use,) it is, unquestionably, still the safest, and, perhaps, also the most useful of all the instruments that are employed for the extraction of the teeth.

59. The remark I have made of the inconvenience and annoyance which are occasioned to the student, by the suggestions of those persons who are so much more industriously engaged in altering and inventing instruments, than in qualifying themselves to use them, can nowhere be better illustrated than in the case of the tooth-key, which has, in many instances, been rendered almost wholly useless by their contrivances. No other example of this need be adduced than that afforded by the additional fulcrum, which was proposed some years ago, with the view of removing the pressure from the affected tooth, to the adjoining sound ones on each side of it. In consequence of this "improvement," it

generally happened that these teeth were severely injured by the operation, and, I believe, it not unfrequently occurred that the whole three teeth were turned out instead of one.

60. In the common tooth-key, the body of the instrument is hollowed, to admit of a director, which passes through it, and should project about a quarter of an inch beyond the fulcrum. This projecting point is intended for occasionally fixing the claw beyond the extremity of the instrument; a practice which is often exceedingly useful in those cases in which it becomes necessary to remove the wisdom teeth of the under jaw with the key, when the coronoid process of the bone will prevent the fulcrum from being placed opposite to the tooth. To the other extremity of the director, a small semi-circular appendage is attached, which enables the operator to guide the movements of the claw with the index finger of the hand in which the instrument is held, and leaves his other hand at liberty for the support of the jaw.

The tooth-key may be used for the extraction of all the molares excepting the upper wisdom teeth, and it is well adapted for removing the bicuspidés, when they are in so carious a state as not to admit of the application of the forceps.

The forceps is also a very ancient instrument, and is perhaps the most original of all, as it may naturally be supposed to have been the implement employed by those "artists" who formerly took a share in performing this operation.

61. It will be requisite for the practitioner to be provided with several pairs of these instruments, varying in size and construction, according to the form and position of the teeth to which they are to be applied. Thus, a straight pair, with a somewhat semi-lunar and pointed extremity, will be required for the extraction of the upper incisors, canines, and bicuspidés; another pair, with a crow-beaked form of point, is better adapted for the removal of the corresponding teeth of the under jaw. The superior molares are extracted by a pair of strong forceps of a peculiar construction; and a fourth modification of the instrument, or what, from its shape, is named the "hawk's bill" forceps, is requisite for the removal of those teeth in the lower jaw.

62. The extremities or points of all these forceps should be hollowed within, in order to apply, with some degree of accuracy, to the convex surfaces of the bodies of the teeth; and the handles of them should be made much broader, and nearer to each other, than those of the instruments in common use, as they will thus be more firmly retained in the hand of the operator.

63. The forceps is a far more difficult instrument to use than the tooth-key; although this will not, at first sight, be evident, on looking to their respective constructions, or attending to the mode in which they act; as the forceps removes the teeth perpendicu-

larly from their sockets, and the key always withdraws them, in a greater or less degree, in a lateral direction. But it will soon be discovered on a comparative trial of the two; and the operator will find, that, in applying the forceps, great caution is necessary, to avoid the danger of breaking the tooth, and considerable experience is required to enable him to use the instrument with facility. But when a command of it is once acquired, it is undoubtedly the most applicable of all those that are employed for the extraction of the teeth.

64. The elevator, or punch, is the instrument required for the removal of the roots, when the bodies of the teeth have been destroyed by caries, or broken over, either by accident, or by ineffectual attempts at extraction.

65. In using this instrument, the greatest care is necessary to prevent it starting from the tooth, and injuring the adjoining parts. In order to guard against this accident, the greater part of the blade, and the whole of the handle, ought to be firmly grasped by the hand of the operator, a small portion of the instrument only being left free, for application to the root. It will also be well, as an additional security, for the practitioner to place his finger before the point of the instrument, to prevent the possibility of the serious injury that might occur if it should happen to start, either from want of caution on the part of the operator, or in consequence of the restlessness of the patient.

66. Many unsuccessful attempts have been made to construct an instrument by which the teeth might in every instance be perpendicularly withdrawn from their sockets. I have seen several contrivances for this purpose, and can give no better idea of their complicated structure, than by comparing them to a steam engine on a small scale, or to the mysterious machine with which Hogarth decorates the studio of the charlatan, in *Mariage à la Mode*. The formidable dimensions and appearance of such an instrument must always prevent it being generally used, or indeed ever being applied to a patient of ordinary delicacy. But even if these insuperable objections could be surmounted, there are many cases in which it could never be employed without increasing the difficulty and pain of the operation. The large grinders of the upper jaw, for example, from the irregular form of their roots, and the mode in which they diverge, could scarcely ever be removed from their sockets in a perpendicular direction, without extensive fractures of the alveolar processes.

I shall now proceed to mention the manner in which these various instruments are used, and the mode in which the different teeth will be most easily extracted. In stating this, I am far from intending to assert, that the practice which I am about to detail is preferable to what other practitioners may follow, as

almost every one has some slight modification of his own, which he believes to facilitate the operation. The following suggestions, however, are entirely of a practical nature, and may, with safety and advantage, be followed by the student, or by the general practitioner whose other avocations may have prevented him acquiring an adequate knowledge of the teeth, and thus induced a reluctance to undertake their extraction.

EXTRACTION OF THE TEMPORARY TEETH.

67. The whole of the temporary teeth are, in almost every instance, easily removed by the forceps. For those of the upper jaw, the small straight instrument may be used; but a curved pair will generally be more applicable to the under. In those cases where the bodies of the teeth have been destroyed by caries, and when it becomes necessary to extract the roots in consequence of the irritation which they cause, a small elevator should be used, if the fangs are so delicate as to be crushed by the pressure of the forceps.

68. The only difficulty which is experienced in extracting these teeth is that occasioned by the restlessness of the little patient, whose terror is so often excited, and always increased, by the ostentatious parade on the part of the practitioner. No formidable-looking machine, known by the name of an "operating chair," should ever be used on this occasion, or indeed on any other, as the appearance of this unnecessary appendage, although by many dentists it is considered one of high importance, always raises an unpleasant sensation in the mind of the patient. An ordinary *negligée* reclining chair is completely adequate in every instance, and on the present occasion, even this may be dispensed with; as the operator had much better seat himself on a common chair, and secure the child with one arm, while he removes the tooth with the other.

69. I have already observed, that the extraction of the temporary teeth ought never to be resorted to, excepting in cases of the most urgent necessity; not only because it is well to avoid performing any operations during those early years, when the constitution is so liable to excitement, but also on account of the connection which subsists between the first and second sets of teeth, which renders it an object of importance to preserve the former as long as possible, in order to allow time for the proper development of the latter, and for the increase in size of the maxillary bones, which is required to enable the permanent teeth to come in, in a regular direction.

EXTRACTION OF THE PERMANENT TEETH.

70. The permanent incisors of the upper jaw are in general easily removed by the straight forceps. The instrument is to be fixed as high up on the root as the gums and socket will allow, and by a slight rotatory motion in one direction, accompanied with a gradually increased extracting force, the tooth will be readily withdrawn.

71. Care should be taken that the pressure of the instrument is not so great as to endanger fracture of the tooth; and no attempt should ever be made to remove a tooth by a sudden jerk, as the breaking of it will be the inevitable result.

72. The inferior incisors are removed in a somewhat different manner, although quite as easily, by the "crow beak" forceps. The convex or longest blade of the instrument is to be placed on the posterior part of the root; but instead of the rotatory motion, which the flatness of the sides of these teeth would not admit of, without seriously fracturing the socket, a slight movement is to be made in an anterior and posterior direction, in union with the extractive effort, and the tooth will be easily brought out.

73. It frequently happens that these teeth are so irregular and crowded, that forceps of the ordinary size cannot be applied. When this occurs, a smaller and thinner pair may be tried, or the tooth may perhaps be laid hold of by its sides, by means of the common straight forceps. If the latter should also be inapplicable, the elevator must be resorted to. The point of the instrument is to be inserted as deeply as possible between the tooth and its socket, and a lever being made, by resting either on the alveolar process, or on one of the adjoining teeth, the tooth will generally be turned out with ease, by the depression of the handle of the punch.

74. The canines, although very firmly attached to their sockets, are in general easily extracted by the forceps, in nearly the same way as the incisors. In the upper jaw a slight turn to one side may be made along with the exertion of the extractive effort; but in the under the flatness of the sides of the fangs, renders this movement impracticable. The teeth must, therefore, be detached from their sockets by a motion of the instrument backwards and forwards, which is to be continued until they are withdrawn.

75. The bicuspidés may be removed in nearly the same manner as the canines. In the upper jaw, however, the flatness of their sides will not permit of the least degree of rotatory motion. They are, therefore, to be moved backwards and forwards while withdrawing them. In extracting those of the under jaw, the round form of their fangs will generally admit of the slight turn which so facilitates the operation.

76. The bicuspidæ are much more liable to be broken during attempts to extract them, than any of the other teeth; and when fracture of them occurs, it is generally difficult to remove their roots with the elevator. The tooth-key, however, will always extract them with facility, especially in the upper jaw. A small sharp and semi-lunar-edged claw is required for the purpose. It is to be fixed as high up as possible on the fore part of the root; the fulcrum, or bolster of the instrument being, in this instance, placed on the inside of the alveolar process, and having a little cotton wrapped round it to diminish the pressure on the gums. The instrument being thus fixed, a slow and steady turn is to be made, and the root will readily be withdrawn in nearly a perpendicular direction.

77. The roots of the small grinders of the under jaw may be removed in the same way, although it is generally a preferable practice to place the fulcrum on the outer side. They are, however, in most cases, more easily extracted with the crow-beaked forceps.

I shall now proceed to mention the mode of effecting the extraction of the molares, which are the subjects of this operation much more frequently than any of the other teeth.

78. The molares may be extracted either by the forceps or by the tooth-key. The former is the preferable instrument, in the hands of a person accustomed to its use, and when the caries has not been extensive; but if the practitioner is inexperienced in the application of the forceps, or if the teeth have become hollow in consequence of the advanced state of the disease, the key will be found to be the safer instrument of the two.

79. For the removal of the molares of the upper jaw, and the wisdom teeth of the under, the large double curved forceps is the most useful form of the instrument; but for the first and second large grinders of the under jaw, the hawk's bill pair is required.

80. In the former instance, the instrument is to be applied as high up as possible on the root of the tooth; and when firmly fixed, a slight motion is to be made in an outward and inward direction, for the purpose of detaching it from the socket. While thus shaking the tooth, the extracting force is to be exerted, and it will generally be easily removed.

81. In applying the hawk's bill forceps, the larger or convex blade of the instrument is to be placed on the inner side of the tooth, and by inclining the handles outwards and inwards, exerting at the same time the extracting force, the tooth will be readily withdrawn.

82. In using the forceps, great care must be taken, that, in applying the force which is requisite for the removal of the tooth, no undue pressure is made upon the handles of the instrument.

This, indeed, is the secret, on the knowledge of which the successful application of the instrument depends; for if the practitioner is not on his guard to avoid exerting this pressure, the breaking of the tooth will be the inevitable result. But if he attends to the caution that has been given, he will find that the teeth will be removed with ease and safety.

83. But when the teeth are extensively decayed, or if the operator has not had that practice in the employment of the forceps which is requisite to enable him to use them with confidence, it becomes necessary to have recourse to the tooth-key. I shall now mention the mode in which this instrument is applied.

84. It has been a subject of discussion, whether the fulcrum of the key should be placed on the outer or on the inner side of the alveolar process; in other words, whether the tooth is to be extracted in an outward or inward direction. In the upper jaw it is, I think, a matter of indifference, although, *cæteris paribus*, I prefer fixing the claw on the inner side of the tooth, and extracting outwardly, because, in using the key, a small portion of the alveolar process is generally detached along with the tooth, and the socket will yield most readily on the external side. But in the under jaw it is imperatively necessary that the teeth should in every instance be extracted outwardly. It is, indeed, surprising that this should ever have been a matter of dispute, as the form of the lower jaw, and the relative position of the teeth to it, clearly indicate the necessity of extracting in this direction. Besides the receding inclination of the inner plate of the bone renders it difficult to find a fixed point for the fulcrum of the instrument to rest upon, and the dense lamellated structure of this part of the jaw prevents it yielding without endangering the occurrence of an extensive fracture.

85. Before using the key, a little cotton lint should be wrapped round the bolster of it, in order to diminish the pressure on the gum. The instrument being thus prepared, is to be applied to the tooth, its claw being fixed as near as possible to the extremity of the root, and the fulcrum placed on the opposite edge of the socket, in a line somewhat more superficial than that of the extremity of the claw. By a slow steady turn of the instrument, accompanied at the same time with a slight degree of extractive force, the tooth will readily be withdrawn from its place.

86. It is frequently of much benefit to combine the use of the forceps with that of the key, and to remove the tooth with the former after it has been started by the latter.

87. The tooth-key is, in many instances, inapplicable to the wisdom teeth, on account of the obstacle presented by the coronoïd process of the lower jaw. The plan already mentioned, of advancing the claw in front of the fulcrum, is often exceedingly

useful in extracting these teeth in the under jaw, but in the upper it is generally inadmissible.

88. The *dentes sapientiæ*, above and below, are however most easily extracted by the large forceps or the elevator. In using the former, the instrument is to be applied in the ordinary way, being fixed as deeply upon the root as the gum and the alveolar process will allow, when the tooth, after being slightly shaken, will in general be easily withdrawn from its socket.

89. In removing these teeth in the under jaw with the forceps, it will facilitate the operation to apply the extracting force in a somewhat angular direction forwards, as the roots of the inferior wisdom teeth generally have this inclination.

90. But if the caries has been extensive, the elevator had better at once be used, instead of being resorted to after the tooth has been broken over by an ineffectual attempt to extract it—an unfortunate occurrence which may occasionally happen in the hands of the most dexterous operator. The point of the instrument is to be inserted as deeply as possible between the tooth and its socket, and a lever being made by resting either on the edge of the latter or on the adjoining tooth, the affected one will be easily turned out.

91. These comprehend the principal modes of effecting the extraction of the various teeth; and although in some peculiar instances, they may require to be slightly varied, yet I may safely state, that in general they will be found effective, and that I have never been under the necessity of resorting to any other means, or of abandoning the extraction of a tooth after making the attempt. Unusually difficult cases may indeed occur, such as those mentioned by Mr. Bell, who says, (p. 302,) “It has in a very few instances occurred in my practice, that the root was so far decayed as to render it impossible to reach it by the elevator applied in the usual manner. In such cases I have successfully adopted the following method of bringing it away: A crucial incision is made in the gum, as nearly as possible opposite to the apex of the root. The gum is then separated from the bone, so as to expose a very small portion of it, which is to be cut away with the point of a strong knife, till an opening is made into the alveolar cavity, and the end of the root is exposed. By placing the point of the elevator between this and the bottom of the socket, the root may be forced out through the natural opening of the alveolar cavity. In cases of alveolar abscess, combined with this state of the root, this plan may be very easily adopted, as the opening in the bone has been already effected for the escape of the pus.”

I must own, however, that I never met with such a case, and that, notwithstanding the high authority from which the treatment that has been mentioned emanates, I should be extremely unwilling to put it in practice.

92. Before concluding, I may remark, that, after the extraction of the tooth, it is well to bring the sides of the gum together with the finger. This is a process, indeed, which is really attended with little or no benefit, although it is in general necessary for the satisfaction of the patient, and may afford an opportunity to the operator of ascertaining that no loose splinter of the alveolar process remains in the cavity.

OCCASIONAL INJURIOUS RESULTS OF EXTRACTION.

93. Extraction of the teeth is occasionally attended with one or two unfavorable results. The most common of these is the splintering of the alveolar process, which in general occurs in every instance of the removal of the molares of the under jaw with the tooth-key, and almost always during the extraction of the corresponding upper teeth, with whatever instrument the operation is performed. The diverging form of the roots of these last teeth renders it impossible that they can ever be withdrawn without a considerable yielding of the sockets, which is generally attended either by a partial splintering of the outer side of the alveolar process, or the fracture of a small portion of it, which is usually brought away adhering to the tooth. No injurious effects will follow these occurrences, if the piece of bone that has been detached does not form a portion of the sockets of the adjoining teeth, which would thus be deprived of part of their support. On the contrary, the removal of a small portion of the bone is rather beneficial than otherwise, as the wound will then close up sooner than it would if the sharp edge of the socket had been left to be removed by the absorbents. The practitioner, however, should take care neither to leave the loose splinter in the wound, where it might endanger the occurrence of suppuration, nor to parade it before the eyes of his patient, if he does not desire to have the unmerited credit of "breaking the jaw bone."

94. Far more serious and extensive splinters of the inner plate of the inferior maxillary bone have been frequently occasioned by the improper application of the fulcrum of the key to the inner side of the tooth. But I need not caution the scientific operator against them, as they can never occur excepting in the instance of the malpractice that has been mentioned.

95. Complete fracture of the lower jaw, or partial dislocation of it, have been enumerated by some authors, as amongst the occasional consequences of extraction; but such serious accidents can never happen except in those cases where the most revolting violence has been used. The operator should, however, in every instance guard against them, by supporting the jaw with one hand while he applies the instrument with the other.

96. Considerable annoyance is frequently occasioned by the

bleeding which follows the extraction of the teeth, in persons who are of a sanguineous temperament, or of a relaxed vascular system. Many cases are known, in which the hæmorrhage has been profuse; and one or two are on record, in which it led to a fatal termination, after the carotid artery had in vain been tied. In these instances, it may well be supposed that every other means had been tried, before recourse was had to such a serious operation, as that of placing a ligature on this important vessel. But in almost every case, the hæmorrhage may be restrained by introducing the extremity of a small roll of lint into the bottom of the cavity, and successively inserting and pressing down the rest of it, until the socket is filled. If this does not suffice, the power of the compress may be still farther increased, by filling up the space with a piece of cork or of ivory, which is to be left so prominent, that the opposite teeth may press upon it, when the jaws are brought together by a bandage.

CHAPTER V.

ON EXCISION AND TRANSPLANTING OF THE TEETH, AND THE IMPROPRIETY OF BOTH OPERATIONS.

BEFORE concluding the description of the operations on the teeth, it may be well to notice two, which were formerly practised to a considerable extent, although they are now nearly, if not altogether, obsolete.

"EXCISION" OF THE TEETH.

The operation of excision was introduced into this country, I believe, by an American practitioner, who proposed curing tooth-ache, by cutting across the irritated tooth, and getting rid of the nerve, either by drawing it out from the canal, or if this could not be effected, by destroying it with the actual cautery, or by means of caustic. The operation succeeded in some instances, but failed in the greater majority; as it generally happened that, when the tooth was cut across, the nerve was at the same time divided, and usually shrunk so far into the canal, that it was impossible to remove it. When this occurred, it was equally beyond the reach of the actual cautery, as the smallness of the canal either prevents the cauterizing iron from entering; or if it admits it, the temperature of the instrument is so diminished before it can be introduced, that it is inadequate to effect the destruction of the nerve on coming in contact with it. The use of the potential cautery is quite as objectionable; for, although the caustic is ultimately more certain in its effects, it is invariably productive of

much pain at the moment of application, and often gives rise to a greater degree of irritation, than that which was occasioned by the disease in the tooth.

The practice of excision is now therefore deservedly abandoned, (unless indeed the operation preparatory to pivoting the front teeth falls under the denomination,) as even in those few instances in which it succeeded, the dead roots often afterwards became a source of irritation in the mouth, and had eventually to be extracted.

But in the great majority of cases, the operation was a decided failure, and generally gave rise to threefold pain; as, for example, in the instance of a large grinder of the upper jaw when three or four different branches of the nerve are laid bare by the excision, instead of the one which had been exposed by the progress of the caries. In many cases the suffering was most acute, and, I believe, one or two are known in which the operation led to a fatal result.

ON "TRANSPLANTING" TEETH.

This operation, the most revolting and unjustifiable of all that have ever been performed on the teeth, or any other part of the body, is now completely exploded from the practice of the modern dentist. But as it was suggested by John Hunter, who has devoted a considerable part of his work to the subject, it will be necessary to notice it, or to pass his details in review. The arguments which Hunter uses in its commendation, and the directions he gives for performing the operation, are so absurd and inconsistent, that were it not well known to have been a favorite practice of his, posterity might well believe that this part of his work was surreptitious.

He commences by mentioning the circumstances favorable to the operation. "Much," he says, "depends upon the patient; he should apply early, and give the dentist all the time he thinks necessary to get a sufficient number of teeth that appear to be of a proper size." In other words, to collect a band of unfortunate wretches for maltreatment.

The teeth best adapted for the operation, are mentioned next. The incisors and canines, he says, are most so; the small grinders not so favorable for the purpose, and "It is hardly possible to transplant the large grinders, as the chance of fitting the sockets of them is very small." A strange way of obviating this difficulty is, however, suggested, for he adds, "When indeed a grinder is extracted, and the socket is sound and perfect, the dentist may perhaps be able to fill it with a *dead* tooth."

It is surprising, indeed, that such an idea should ever have

emanated from so profound a physiologist as Hunter ; and proves how much a man's better judgment may occasionally be biassed, when in the pursuit of a favorite object.

The merits of the "scion" tooth, by which he means the one taken from the hapless victim, are next discussed. He observes, "It should be a full grown young tooth, because the principle of life and union is much stronger in such, than in old teeth." He moreover recommends, that the "scion tooth should be that of a female, for female teeth are in general smaller than those of men."

The next difficulty to be surmounted, was to find a tooth that would accurately fill the socket into which it was to be transplanted. Hunter observes, "When the fang of the scion tooth is larger than that which it is intended to supply, it must be made smaller, but only in that part where it exceeds. But the necessity of this should be avoided if possible; for a tooth that is filed has lost all those inequalities which allow it to be held much faster. If, however, some part of the tooth must be removed, it should be done so as to imitate the old tooth as much as possible."

He adds, "But the remedy is to *have several people ready*, whose teeth, in appearance, are fit; for if the first will not answer, the second may."

So attached was Hunter (and, I believe, the greater number of his contemporaries) to this unscientific operation, that, even if, in the number of the unfortunate individuals thus selected for abuse, a tooth of the requisite form was not to be found, he still suggests the propriety of transplanting, and recommends "a dead tooth to be taken by the dentist, and filed down to fit the socket in which it is to be placed, and afterwards fastened to the other teeth, with the silk, or sea-weed. The patient," he observes, "must now finish the rest. He must be particularly attentive at first, and give it as little motion as possible, and must take care not to catch cold, or expose himself to any of the other common causes of fever."

It is unnecessary to enter into farther detail of a practice so unjustifiable and absurd, that it must always remain a matter of surprise that John Hunter ever countenanced it. He himself, indeed, admits that "this operation, like all others, is not attended with certain success. It sometimes happens that the parts do not unite; and in such cases, it often acts as an extraneous body; and instead of fastening, the tooth becomes looser and looser; the gum swells, and a considerable inflammation is kept up, often terminating in gumboils. In some cases also, where it is not attended with success, these symptoms do not exist. The parts appear pretty sound; only the teeth do not fasten, and sometimes drop out."

In conclusion, I would observe, that no one would now be jus-

tified in reviving this operation for the purpose of experiment ; and still less, from more improper and interested motives ; as, besides the cruelty of it to the unfortunate class of beings from whom the teeth were generally taken, it frequently led to the introduction of deplorable infectious diseases into the constitution ; and is, to say the least of it, a practice unscientific in its nature, and unfortunate in its result.

PART IV.

ON ARTIFICIAL TEETH.

CHAPTER I.

General Observations on Artificial Teeth—Various kinds of them—Their Respective Advantages—Disadvantages of “Mineral,” or Porcelain Teeth—Means of Preserving Artificial Teeth.

THE construction of artificial teeth is an invention of considerable antiquity, and is supposed to have been known to the Romans upwards of two thousand years ago.* It would be vain, however, to attempt to describe the condition of the art during that early era; and still more so, to mention its progressive advances to its present state of comparative perfection. The improvement of it, indeed, has not been in proportion to the number of its years; and in this country, until within the last half century, this important branch of the dentist's duty, if not the profession itself, had but little claim to be considered as a respectable subdivision of medical science.

Artificial teeth are formed, either from the large tusks of the southern sea horse, or of natural teeth, which may be fixed either upon sockets of this hard species of ivory, or on gold plates, accurately adapted to the space to which they are to be applied.

* All the commentators, from Aristotle downwards, have been puzzled by the teeth of Marcus Furius Dentatus, the Roman consul. According to some of them, the patrician received his cognomen from the circumstance of his teeth being of that elegant order, which is vulgarly known by the term “buck;” while others maintain that he had but one tooth, which, however, was of wonderful magnitude, and occupied the whole range of the mouth. Possibly it may facilitate the inquiry, if it is suggested, for the benefit of these naturalists, that it might have been only an ill-made set of artificial teeth, such as formerly may have been suspended, *in alto relievo*, before the door of some indifferent practitioner in ancient Rome, as they now are, in defiance of delicacy, in modern cities.

Natural teeth may also be attached by means of gold pivots to the roots which remain in the mouth after the bodies of the teeth have been destroyed by caries, or broken over by an accidental blow. This is by far the most imperceptible of any of the modes of fixing artificial teeth; and, when properly done, a tooth kept up in this way, will often bear a minute examination by an experienced dentist, without being discovered, and may be used with as much freedom by the patient as any of the adjoining natural teeth. The operation, however, is limited to the six or perhaps the eight front teeth of the upper jaw.

Artificial teeth have also of late years been made from a porcelainous substance, and under the name of "mineral" and "terro-metallic" teeth, have afforded an extensive range for empirical deception. The attraction held out is their alleged "incorruptibility," by which term the unwary are entrapped, and lead to believe that teeth of this description are much more durable than the natural ones. The very reverse of this is the case; for although they are not subject to change of color, from their vitreous substance being impervious to the saliva, yet they are in every instance so brittle, as to be easily broken off, on coming in contact with those of the opposite jaw; and in the rare cases in which they do not thus give way, the natural teeth to which they are opposed, are generally seriously injured by the friction of the silicious body, which never, under any circumstances, feels congenial to them.

When these mineral or china teeth were first introduced into this country from France, (for it is to our neighbors on the opposite side of the Channel that we owe these, as well as many other similar, ephemeral productions,) the greatest mystery was affected on the subject of their composition, although any of our potters or porcelain makers could easily have disclosed it, as it is in every respect analogous to the ware which they fabricate. The most extravagant expectations were then formed from them; although few or rather none of the advantages which they were supposed to possess, have been realized, and they are now considered to be a complete failure. They have never been much used by any of the leading dentists of the day, and I believe are now wholly discountenanced by the respectable part of the profession, although they still reign paramount with the disreputable.

Natural teeth fixed upon a plate of gold are next to the pivot in point of appearance, and when accurately fitted, may always be worn by the patient with the greatest comfort. This mode of attaching artificial teeth is also more generally in use than any of the others, as nothing can be easier than to make an indifferent plate and "rivet" teeth upon it, although none but an expert dentist can form a good one.

If properly made, a gold plate ought to fit accurately into all the undulations of that part of the gum which it covers, having concavities to correspond to the prominent points of the membrane, and convexities to enter into its depressions. It should also closely surround the teeth behind which it passes, but without exerting undue pressure upon them.

It is to be retained in its position by broad springs, or plates of gold, attached to the posterior surfaces of the remaining teeth, and occasionally embracing the fronts of them, or altogether surrounding them, especially those in the back part of the jaw. Great benefit, indeed, will sometimes be derived by extending the plate over the whole surface of one or more of the posterior teeth in the form of a "cap." The pressure of the piece is thus chiefly directed against the crowns of the teeth, and its effect upon the gums is either much diminished or altogether removed. Neither of these modes of attaching the plate will occasion injury to the natural teeth if the springs or caps have been properly applied to them; and I have no hesitation in adding, that the gross misstatements which empirics are constantly publishing upon this subject, are generally the result of their own malpractices.

The natural teeth, with which the deficiency is to be filled up, are to be attached to the plate, not by the common but imperfect practice of "riveting," and thus leaving the heads of the nails either to irritate the gums or prevent the accurate adaptation of the plate to the surface, but are to be fixed by means of gold pivots soldered upon the plate, and forming an integral part of it. When a plate is thus constructed, the surface of it which is in contact with the gum will afford no indication of the manner in which the teeth have been attached, and will fit so accurately at every point, as to form a complete vacuum, preventing the entrance of adventitious matter beneath it, and, by its equal adaptation to the surface, will greatly diminish the unpleasant pressure which is generally at first experienced from all artificial teeth.

The gold plate is required in all those cases in which roots of teeth remain in the mouth, and will not admit of being pivoted, or when the absorption of the alveolar processes has not occurred to the usual extent, and the opposite teeth either strike upon the gum, or high upon the posterior surfaces of their antagonists.

There are many instances, however, in which it becomes necessary to form artificial sockets, when absorption of the natural ones has taken place to the degree which it usually does, when the teeth have been lost from this cause. In such cases, the sea horse bone is invaluable, as not only artificial teeth, but a very good representation of the external appearance of the natural sockets and gums, may be formed of it; and the effect may be still farther heightened by staining the ivory to resemble the natural hue of the gum.

The same principles are to be observed in the construction of artificial sockets of bone, which I have already mentioned in my remarks upon gold plates. The socket must accurately fit every point of the surface which it covers, and form a vacuum so perfect, that it will exclude not only the particles of alimentary substances, but even the air itself, from entering between it and the gum. The piece will then often be retained in its place solely by that pressure which the atmosphere exerts upon all solid bodies. The principle by which the artificial piece is thus fixed in the mouth, is commonly termed "suction." The expression, however, is erroneous, as in reality no such power as suction exists. But when two solid substances are brought together, and the air withdrawn from between them, they will adhere to each other, in consequence of the pressure of the air upon their surfaces.

The artificial teeth may be formed either out of the bone of the socket, or of the enamel with which this species of ivory is surrounded; or natural teeth may be adapted to it, and attached by a gold or silver screw—the old plan of riveting being in this case as inapplicable as it is in the instance of the gold plate. The natural teeth are infinitely preferable to either of the others, both of which are more or less objectionable; those that are carved out of the bone rapidly losing their color on exposure to the influence of the saliva; and the enamel, from the difficulty of procuring it of the exact form which is required for the natural curve of the jaw, and also on account of the peculiar pale blue color which it almost invariably acquires in the mouth.

Natural teeth are indeed in every respect superior to all others that either have been, or ever will be, discovered; for it is beyond the power of the most accomplished artist to form an artificial tooth which will have the same appearance as a natural one, or to invest any foreign body with the peculiar attributes of the human teeth, and the congenial feeling which they have in the mouth. And yet, prejudice has long been prevalent against them, although it is now rapidly subsiding, notwithstanding all the attempts of interested persons to foster it. But a moment's reflection will convince the most sensitive, that natural teeth, at the time they are used for this purpose, are as completely disorganized and free from taint, as it is possible for any substance whatever to be.

All of these artificial teeth are subject to that decomposition which every inorganic substance undergoes in the mouth. The hardest ivory will, in the course of time, be reduced to the consistence of cartilage, and the most perfect natural teeth will yield to decay, when placed in this situation. Artificial teeth, however, will generally remain for three years in a state of tolerable preservation. In many cases they may continue much longer,

although, on the other hand, I have known numerous instances in which they have been completely destroyed by the action of the saliva, in so short a period as from six to twelve months.

Much depends upon the attention of the patient, as artificial teeth, like the natural ones, are materially preserved by keeping them in a state of purity. The use of a brush and water, with any of the finer soaps, and a little levigated chalk or finely pulverized pumice-stone, will be sufficient for this purpose, and the unpleasant taint, which they are apt to acquire, may be removed by the addition of a little camphor.

The following formula, which has been mentioned to me by a distinguished patient, will be found to be remarkably good :—

R Levigated chalk, Pumice-stone, pulverized, Camphor, Finest soap, Water, as much as shall be necessary.	}	Equal parts.
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To be formed into a paste, which is to be placed on the teeth at night, and brushed off with water in the morning.

CHAPTER II.

ON THE CONSTRUCTION OF ARTIFICIAL TEETH.

Of Models, &c.—Of Pivoting—Of Gold Plates—Of Artificial Sockets, with Natural Teeth—Of Staining the Bone—Of Screwing Teeth—Of Spiral Springs, &c.

97. THE first part of the process consists in taking an accurate impression in wax of the part where the deficiency exists. The wax used for this purpose should be of the purest description, and whitened by exposure to moisture and the rays of the sun, instead of by the ordinary bleaching process, by means of muriatic acid and chlorine, which always impair its ductility, and render it brittle, although the same effect is often produced by adulteration.

98. The wax is to be softened by exposing it to the heat of a common fire, and reduced to an equal consistence, by manipulation, before applying it to the mouth. An accurate impression is then to be taken of the part where the deficiency is, and of the adjoining teeth, to which the artificial ones are to be attached. If only a few of the natural teeth are lost, it will not be necessary to extend the wax beyond two or three of the teeth adjoining the

space ; but if the whole, or greater number, of the set, are wanting, the model must extend over the whole surface of the jaw.

99. It is of the utmost importance that the impression which is taken of the mouth should be minutely correct, as the success of every subsequent part of the work almost wholly depends upon the accuracy of the model. The operation of taking the impression will be much facilitated by retaining the wax within a silver scoop adapted to the form of the jaw. By means of this the wax is not only more accurately applied to the gum, but it is also prevented from being compressed while withdrawing it from the mouth.

100. The impression thus obtained is to be carefully filled with a mixture of plaster of Paris and water. The paste thus formed in a short time becomes hard ; when it is so, the wax is to be removed by again softening it before the fire, and gradually withdrawing it. Care must be taken that the teeth of the model are not broken during the removal of the wax, although the chance of the occurrence of this accident will be greatly diminished by having previously inserted small brass pins into the cavities in the wax which represented the teeth.

101. This plaster of Paris cast will exhibit an exact model of the parts, if the impression has been accurately taken ; and it is to be prepared for future operations, by first expelling the superfluous water by the heat of the fire, and afterwards placing it for a few minutes in a mixture of equal parts of wax and resin. When the model has thus been hardened, the process of adapting the artificial teeth to it is to be commenced.

OF PIVOTING TEETH.

102. The pivot, which consists in grafting the body of another tooth upon a root remaining in the mouth, is by far the most effectual mode of attaching artificial teeth, and when properly applied, it is difficult for the most accurate observer to discover those that have been fixed in this manner, from any of the adjoining natural ones.

103. The operation, it has already been stated, can only be performed on the incisors, canines, and bicuspidés of the upper jaw, but, in general, ought not to be extended beyond the six front teeth, as the small grinders, from the peculiar shape of their canals, do not so readily admit of its successful application ; and the teeth in this part of the jaw are so much used in masticating, that a pivoted tooth here is generally productive of more inconvenience than utility.

104. The first part of the operation consists in preparing the root for the reception of the tooth which is to be attached to it. If any part of the body of the tooth remain, it may be cut across,

either with a small saw, or by a pair of cutting forceps, and the rest of it filed down to a level with the gum. The surface should be made as flat as possible, and the file that is used should be either of a round or half round form; the sides of the root will thus be left more prominent than the centre, which will prevent the pivoted tooth turning round on its axis, and greatly improve its appearance.

105. The canal in the root is next to be opened up to the requisite size, by means of small broaches, or the cautious use of the drill. This is generally the most painful part of the operation, and must be performed with the utmost caution. Great care must be taken that the instrument is not broken in the root, by the starting of the patient; for this is an accident of the most serious nature, which can only be remedied by the extraction of the root, if the broken piece of the instrument cannot be withdrawn.

106. In selecting a tooth to fill up the deficiency, the operator should choose one that resembles the original tooth, not only in shape and general appearance, but also as nearly as possible in the diameter of its root. The reason of this is obvious; for if the diameter of the neck of the tooth, which is to be used, be less, from its anterior to its posterior surface, than that of the root remaining in the mouth, the pivoted tooth will be proportionally within the line of the other teeth, and the edge of the root will project beyond the surface of the pivot. On the other hand, if the diameter of the tooth be greater than that of the root, the reverse will take place, and the pivoted tooth will project beyond the root; which it is equally desirable to avoid, although the imperfection of the operation is not so conspicuous as in the former instance.

107. The root having been duly prepared, and, if necessary, a model of it taken, the tooth which is to be pivoted is to be accurately fitted to the model, by means of the rose-pink and water color, and afterwards, in a similar manner, to the root.

108. The next step consists in making an opening into the pivot, corresponding to that in the root. This is the most important part of the whole operation; for unless the centre has been taken with geometrical precision, the pivoted tooth will afford neither comfort nor satisfaction to the patient.

109. There are two different ways of finding the centre of the tooth, both of which may answer equally well, although the one which I shall first mention is the preferable. It consists in fitting into the canal a small pin of birch, which is to be cut across with a pair of small dividing forceps, a very little below the surface of the root. The projecting extremity of the wood is to be colored with the rose-pink pigment; and the tooth being carefully applied to the space, a small speck of color will be left upon it, which will indicate the centre of the root.

The same result is attained by the other mode, in a somewhat different manner. The body of the tooth is, in this instance, to be covered with a thin layer of wax, and on being placed in contact with the root, a small prominence will be left on the wax, corresponding to the opening in the root.

110. At the point thus marked, a hole is to be drilled into the body of the tooth, and a piece of gold wire corresponding to the size of the opening in the root, attached to it by means of a screw. The gold pivot may be still more securely fixed by a small cross pin, extending from one side of the tooth to the other, through the centre of the wire.

111. The pivot is now to be accurately adapted to the direction of the opening in the root, and surrounded with a small quantity of soft silk thread. This diminishes any irritation which the presence of the gold might occasion, and firmly retains the tooth in its position.

112. A slight degree of pain is very frequently experienced in the root for a short time after the tooth has been pivoted. The irritation almost invariably subsides in the course of a few days; and I have never in any instance found the symptoms exceed those of a smart attack of toothache.

Cases, however, have been mentioned, in which the irritation has been far more severe; but I conceive that it has always been occasioned by the improper performance of the operation. If the pain continue beyond the period I have mentioned, it may be suspected either that part of the nerve remains, or that the gold pivot projects beyond the extremity of the root into the alveolar process.

OF GOLD PLATES.

113. The gold plate, with natural teeth attached to it, is inferior only to the pivot in point of appearance, and the smallness of the space which it occupies in the mouth. When properly constructed, it is nearly as imperceptible a mode of fixing artificial teeth.

114. The plate becomes indispensable in all those cases in which a considerable number of the roots remain in the mouth; or when these have been lost, and absorption of the sockets has not proceeded to the usual extent; or when the under teeth strike high up, on the gum or on the posterior surface of the upper ones.

115. The application of the plate is chiefly confined to the upper jaw. In the under jaw, the employment of it is not so advantageous, although it sometimes becomes necessary to use it here; especially in those instances in which the whole of the upper teeth, and only a few of the under, have been lost, and when spiral springs are required to retain the artificial upper set in its position.

116. For the construction of a gold plate, it will be necessary to make a cast of the model in bell metal or the hardest brass. Upon this cast a reverse is to be made by surrounding the sides of it with soft pipe-clay, and pouring liquid pewter on the surface. If the plate is to be large, and difficult to strike up, it will be advantageous to have two of these reverses,—one of them considerably smaller than the other.

117. Between this reverse and the cast, the plate is to be struck up. If the case be difficult, it will greatly facilitate the operation to anneal the gold repeatedly during the process. The ductility of the metal is thus increased, and the danger of its splintering diminished. By attention to this, and the employment of gold of the proper quality, there will rarely be found much difficulty in striking up a plate to the most unequal surface.

118. The gold used for this purpose ought never to be of a lower standard than twenty carats. If it be finer than this, the plate will not possess the requisite degree of hardness; and when of inferior quality, it is not only difficult to strike up, but will occasion a disagreeable taste in the mouth.

119. When the plate has been struck up, it will in general be well to try it in the mouth before attaching to it the springs by which it is to be retained in its place; and if it apply closely to the teeth, it will be necessary to file away a part of the gold corresponding to the thickness of the metal which is to be used for the spring.

120. In attaching the springs, it ought always to be an object to make them as broad as possible, and to apply them to the posterior teeth. The injury which a narrow spring so often produces on the tooth which it surrounds, is thus not only prevented, but the external appearance of the gold is also concealed.

121. It is frequently highly advantageous to carry the springs over the whole surface of one or more of the posterior teeth in the form of a cap, instead of merely surrounding their sides and anterior and posterior surfaces. This not only retains the piece more firmly in its place, but prevents any annoyance being occasioned by the pressure of it upon the gum, and is almost always required when it becomes necessary to apply the plate to the under jaw, as in those instances where but a few of the teeth there have been lost, although the whole of those in the upper may have been so; when a plate must be put in the lower jaw to afford attachment to the spiral springs by which the upper artificial set is to be retained in its place.

122. The same mechanism becomes necessary in those cases in which the whole of the upper teeth have been lost, while the under are in a state of perfect preservation. Such an occurrence is occasionally met with; and I have known several instances in

which eminent practitioners had declined to make any farther effort, after the patient had in vain attempted to keep up the artificial upper set by what is generally but erroneously termed suction. No difficulty, however, was found in fixing the piece by means of a pair of spiral springs, which were attached below to caps enveloping the molares and adjoining biscopides.

123. The plate having been duly fitted to the mouth, the next part of the process consists in adapting the natural teeth to the surface of it. I have already mentioned that these are to be attached, not by the common and unscientific practice of riveting, but by means of pivots soldered to the plate. This more recent mode of fixing the teeth is one of the greatest improvements which have ever been made upon the gold plate, and contributes in the highest degree, not only to its appearance and durability, but also to the accuracy of its adaptation to the gums or any roots that remain, and the ease with which it will be worn by the patient.

124. In attaching these pivots to the plate, nearly as much mathematical precision will be required, as in the instance of finding the centre of the tooth in cases of pivoting. The mode of proceeding is, first to fit all the natural teeth to the plate, by means of the rose-pink and water color; leaving them of considerably greater length than they will ultimately be. An opening is then to be drilled in the centre of the tooth, and on applying it to the plate, and slightly striking it with a small instrument, a portion of the comminuted bone will be left on the surface, and indicate the point on which the pivot is to be placed.

125. When the pivot has been soldered on, the tooth is to be fitted to the plate, until it is shortened to the extent required. The adaptation of the adjoining one is to be proceeded with in a similar manner; and thus with the remainder of the teeth successively, until the whole of them have been accurately adapted.

126. While fitting on the teeth, the gold must be filed away to allow them to project in front of the plate; so that on being applied to the mouth, they may be in close contact with the surface of the gum or roots, and no appearance of the metal indicated. The teeth should advance in front of the plate, by little more than the thickness of the enamel, and no more of the osseous part of the tooth should project than is necessary to give support to the vitreous substance.

127. The plate is now to be cleaned, either by throwing it while warm into muriatic acid, or by boiling it in diluted sulphuric, and after hardening the springs by means of a hammer and a small anvil, the surface should be polished with pulverized pumice-stone, crocus, and oil, and afterwards with rouge and water.

128. The teeth are fixed upon the plate, by the simple process of wrapping a little soft silk around the pivots, and moistening it

with spirit varnish It will be well also to cover with the varnish the surface of the tooth which is in contact with the gold ; as the saliva is thus for some time prevented from acting on the osseous substance.

OF ARTIFICIAL SOCKETS.

129. Artificial sockets are constructed with a more extended object than either the pivot or the gold plate. When the latter are used, it is in general merely requisite to fill up the space which the bodies of the natural teeth had occupied ; but when the socket is required, it is necessary to form an artificial substitute not only for the teeth, but also for the alveolar processes which have been removed by absorption.

130. They are also formed by a more gradual and laborious process than either of the others. Thus although a pivot may perhaps at once, and by the eye alone, be adapted with considerable accuracy to the root, and a plate may, by a single stroke of the hammer, be extended over a large portion of the cast, yet in making an artificial socket, the bone must be gradually cut away, and equally applied to the surface of the model, otherwise it will never fit with accuracy, or be worn with comfort.

131. Artificial sockets are usually formed out of the tusks of the hippopotamus or southern sea horse. Those of the elephant, and north sea horse or walrus, are also sometimes used for this purpose ; but they are much inferior to the former, as the ivory soon loses its color, on exposure to the action of the saliva ; and the walrus bone is often of an oily texture, and more apt to acquire a disagreeable taint, and occasion an unpleasant taste in the mouth. The sea horse horn is also greatly superior to them in hardness, and in the whiteness of its color, and power of retaining it ; and especially on account of a considerable part of its surface being surrounded by an extremely hard enamel, of which the others are altogether destitute. The artificial teeth may often with much advantage be formed out of this enamel, when there exists any prejudice against natural teeth on the part of the patient.

132. There are two different ways of cutting up the sea horse horn into the blocks from which the artificial sockets are to be made. If the teeth are to be formed out of the enamel, the tusk is to be merely transversely divided, and as much of it cut over as is necessary for the thickness of the socket : the fibres of the bone are thus perpendicularly applied to the surface of the model.

133. But if natural teeth are to be attached to the socket, or if artificial ones are to be carved out of the plain bone, it will be better to apply the fibres of the bone horizontally to the model,

as the enamel will thus be retained on the grinding surfaces of the artificial teeth. A transverse section of the tooth is in this instance to be made, the length of which should correspond to the breadth of the piece, and the block is to be formed out of this, by again slitting it up in a horizontal direction.

134. The block is to be horizontally applied to the model, the surface of which being colored with rose-pink and oil, a portion of this will adhere to the bone at the points of apposition, and thus indicate the part which requires to be removed. These colored marks, and especially those that are white in the centre, are to be cut away until the socket has been excavated to the requisite extent, and the bone is in close and equal contact with every point of the surface which it covers.

135. The piece is now to be reduced nearly to the size and shape which it will ultimately be: but it will be well to leave it large in every direction, until it has been tried in the mouth, as it will often require to be removed to a greater extent in one part than in another. As a general rule, it may be observed that pieces for the upper jaw should be left more prominent on their lower edge than at that which is in contact with the gum, while those for the under jaw generally require to be reduced in the opposite direction.

136. The block is now ready for being fitted to the mouth. This is often a much more difficult part of the operation than the adaptation to the model, and will rarely be successfully accomplished, unless by the individual who either has formed the socket, or is possessed of sufficient manual dexterity to have been able to do so. On the other hand, a mere mechanical artist, however well he may have fitted the socket to the model, will seldom adapt it adequately to the mouth. But to perform this important part of the operation with success, the dentist must combine a considerable degree of manual ability with an accurate knowledge of the anatomical structure of the mouth.

137. In adapting the piece to the mouth, the same course is to be followed as in fitting it to the model. If the socket do not accurately apply to the surface, the rose-pink and water color must be used to indicate the points of contact, and these are to be carefully cut away until the piece is brought into close apposition with the parts over which it is to extend. In the same way it is to be adapted to the teeth, whether natural or artificial, in the opposite jaw.—It may here be remarked, that the practitioner will do well to recollect, that however accurately the artificial piece may fit to the surface, it will never remain steady in its place, nor be worn with ease by the patient, unless allowance is made for the free motion of the frænum of the lip in the upper jaw, and of the tongue and sublingual gland in the lower.

138. The piece having been adequately adapted to the mouth, and a small line marked upon it corresponding to the centre of the jaw, the next part of the work consists in forming artificial teeth upon it; or if natural teeth are to be used, in fitting them to the socket.

139. If artificial teeth are to be formed, they are to be first marked off with the file upon the surface of the bone, and the requisite shape afterwards imparted to them by means of engraving instruments. It is usually necessary, at the same time, to form a representation of the appearance of the gum and anterior surfaces of the alveolar processes.

140. The posterior, or palatal and lingual, part of the piece should be hollowed as far as practicable, and may be left uncarved, as it is not necessary here to form a representation of the natural teeth, for the object of appearance, and the plane surface will in general be more agreeable to the tongue.

141. The grinding surface of the artificial teeth should be carved to resemble that of the natural set, unless the enamel has been retained on the bone, when it is merely to be diagonally or crucially notched with the file. But this part of the work may always with advantage be postponed until the piece has been stained.

142. When the artificial teeth are formed out of the enamel of the sea horse bone, they are to be carved in a similar way; but almost the whole of the work must, in this instance, be done with the file, as the hardness of the enamel renders it impervious to any other instrument.

143. When natural teeth are to be attached to the artificial socket, they are first to be polished, if it be required, by means of pumice-stone and water; and afterwards to be cut across at the neck, and filed into a semi-elliptical form. It is usually necessary to file them in an oblique direction, making the posterior surface of the tooth considerably shorter than the anterior, especially if the socket be thin. In thus preparing the teeth, it is highly necessary to make their fitting surface perfectly plane.

144. In adapting the teeth to the socket, no instrument but the file should be used, as the surfaces can by no other means be made so equal, or their apposition rendered so complete.

145. The fitting surface of the tooth having been colored with the rose-pink and water, and applied to the socket, the indicated points of contact are to be removed by a round, or half round file. The tooth is thus to be gradually let down to its place, and temporarily fixed with a little wax and resin. The rest of the teeth are to be fitted in a similar manner; the centre teeth being always let down first, and the adaptation of one tooth completed before commencing with another.

146. It is not necessary to place more than six, or, at the utmost, eight, natural teeth upon any artificial socket, as no part of the set posterior to the first small grinder is seen in the ordinary aspect of the mouth. The posterior part of the socket is therefore either to be carved in representation of the natural teeth in this situation; or it may, with more advantage, be left altogether plain; as, when in this condition, it not only presents less impediment to the motions of the tongue and cheeks, but greatly contributes to the preservation of the piece.

147. When spiral springs are to be used, the sides of the artificial set must be made quite plain, to allow the springs to move without restraint. The spaces on which the springs are to move should be somewhat sunk beneath the line of the adjoining surface, which prevents any annoyance being occasioned to the cheeks by the prominence of the springs, or of the pivots by which they are fixed, and also assists in keeping the former in their proper position. The form of these spaces must be familiar to every practitioner. It would be vain, however, to attempt a verbal description of them, which I the more regret, as they are generally very inadequately constructed.

148. When the necessary form has been given to the artificial piece, the surface of it is to be rendered smooth by means of the file, and afterwards of the scraper, used in the same direction: in the application of both of these instruments, it should be the study of the artist to follow, as far as practicable, the course of the fibres of the bone. The whole of the piece is afterwards to be polished by the successive application of fine sand-paper, pulverized pumice-stone, and levigated chalk, with water.

OF STAINING THE SOCKET.

149. The next part of the process consists in imparting to the socket a color resembling the natural hue of the gums. There are various means of staining the bone, all of which may answer the purpose equally well, although I prefer using cochineal, sanderswood, and diluted acetic acid, or the purest vinegar, in the proportion of three grains of the former, one drachm of the second, and half a pint of the third: the proportions, however, may require to be varied, as the dyes are not always of the same quality.

150. The staining liquid is to be heated in a vessel formed either of pewter or of earthenware; and when it has attained the boiling temperature, the piece is to be immersed into it, and allowed to remain between one and two minutes, and afterwards plunged into warm water. All those parts of the bone, which are not intended to be colored, should have been previously covered with spirit varnish, which will prevent the dye affecting their surface.

151. The varnish, and whatever specks of the coloring matter may have adhered to the artificial teeth, may be easily removed by the scraper. The edges and crowns of the teeth are then to be formed, and their bodies polished in the way already mentioned.

152. If natural teeth have been fitted to the socket, they are now to be attached to it. This is generally done by means of the screw and rivet, but the practice is exceedingly inadequate, as the teeth are always imperfectly fixed in this way; and there are many cases in which, from the inequalities of the surface of the socket, the rivet cannot be properly made. The heads of the nails are also apt to occasion annoyance to the gum, and the part of the bone immediately under the rivet is generally so injured by the hammering and compression, that it soon gives way, and the teeth become loose.

OF SCREWING TEETH.

153. The mode of attaching the teeth by means of a screw, which extends through the socket and body of the tooth, is in every respect infinitely preferable. The teeth are thus far more firmly fixed, as every turn which the screw makes in the socket is equal to a rivet; and, as the heads of the screws can always, in this instance, be cut away to a level with the surface of the bone, they will neither disturb the fitting of the piece nor irritate the gum. The practice of screwing is, however, much more difficult than that of riveting, and cannot be safely and successfully adopted excepting by an experienced artist.

154. The first part of the operation consists in drilling a hole in the body of the tooth, after it has been accurately fitted to the socket by means of rose-pink and water color. This opening should extend as far down as the enamel, and be made in the direction of the axis of the tooth; the point of the drill, however, being directed towards the posterior part of the tooth; and thus leaving, at the bottom of the opening, a small portion of the bone to support the enamel on the anterior surface, which will prevent it being discolored by the contiguity of the screw.

155. The corresponding opening in the socket must be drilled with the nicest precision. The point at which it is to be made will be indicated by placing the tooth accurately in its position, and slightly striking it with a small hammer, when a little of the bone dust will be left on that part of the socket which corresponds to the opening of the tooth. When the socket has been perforated, it will be necessary to extend the drill through it into the tooth, that the line of the openings in both of them may be made uniformly straight.

156. A screw is now to be made through the socket by means of the tapping instrument, moistened with water; and the tooth having been applied to its place, the tap is to be advanced a turn or two, until it has made a short screw in the tooth, corresponding to the course of that in the socket. The instrument is then to be withdrawn, and the tooth tapped, by itself, in the direction indicated.

157. It is of the utmost importance that the course of the screw, in the socket and in the tooth, should be completely in unison. This, indeed, forms the chief difficulty in the practice of screwing, and is the only secret in the art; for unless it is attended to, the tooth can never be adequately fixed.

158. A gold screw of the requisite size having been prepared, is to be inserted into the socket, and advanced through it and the tooth, until it has attained the extremity of the opening. Great care must be taken to push it no farther, lest it lead to the splintering of the tooth, or the overhauling of its screw. It requires a considerable degree of delicacy of touch in the fingers to ascertain when the screw is, in the technical language, "home;" and this can only be acquired by experience.

OF SPIRAL SPRINGS, &c.

159. Artificial sockets are frequently retained in their position by the accuracy of their adaptation, and the pressure which the atmosphere exerts upon all solid bodies. In the under jaw the gravitation of the piece also assists in keeping it in its place, and small sockets may generally be adequately fixed by this means alone, if they have been accurately fitted. In the upper jaw the weight of the artificial teeth has, of course, a counteracting tendency; and it is almost always necessary here to attach small pieces to the adjoining natural teeth, either by means of a ligature, or by a small piece of gold wire, adapted to the neck of the tooth, and termed a "spring." But it should be kept in recollection, that these springs are chiefly intended for keeping the artificial piece in its place, and that the firmness and steadiness of it must depend entirely upon the accuracy of the fitting.

160. It very frequently happens, in cases where an entire set of teeth is required for one or both jaws, that, however accurately the socket may fit to the surface, it cannot be in the slightest degree fixed by the aerial pressure. This circumstance would almost lead us to suppose, that, in those instances in which artificial teeth are attached in this way, it may in a great measure depend upon some peculiar but unknown condition of the gum, which is favorable to the adhesion.

161. The piece, however, may always be firmly fixed to its

place by the application of a pair of spiral springs, and it will generally be found preferable to use them even in those cases in which a considerable degree of the atmospheric pressure appears to be exerted; as they never occasion any annoyance in the mouth, and always afford great additional security.

162. These spiral springs should be made of hard gold, of the quality of eighteen carats, rendered elastic by drawing it through the successively smaller openings of a steel plate. When thus reduced to the requisite size, the gold is to be coiled up, in a spiral direction, on a piece of wire, or by an instrument contrived for the purpose. Each spring should be two inches long, and both of them must be of an equal strength.

163. To the extremities of the springs, small swivels, or eye-lets, are to be adapted, by means of which they are to be attached to the piece. These eye-lets are to be fixed, by a rivet, to pieces of gold wire, screwed to the sides of the sockets; a small piece of gold, termed a "washer," being interposed between the swivel and the head of the nail, to diminish the friction, and allow greater freedom of motion.

164. The spring should, on each side and in both jaws, be placed at an equal distance from the centre of the mouth. The most favorable point for fixing them, is at that part of the piece which corresponds to the line between the bicuspidæ, although their position may sometimes be slightly varied, if any of the natural teeth remain in the mouth in this situation.

165. It has already been mentioned that a considerable obstacle is often presented to fixing the springs in those cases in which most of the posterior teeth of one jaw remain, while all those of the other have been lost, and spiral springs are required to keep the artificial set in its position. Thus, for example, if all the upper teeth have been lost, and none of the under set, excepting the two posterior molares, on each side, the springs will not act properly, if fixed so far back in the under jaw; but the difficulty will be easily overcome, by attaching to the socket a small piece of gold plate, which should project as far forward as the point opposite to the small grinders, where a pivot of gold wire is to be soldered to it, to which the swivel of the spring is to be fixed. Again, if none of the under teeth have been lost, and spiral springs are necessary to fix an upper set, a plate must be struck up, to fit the surfaces of the inferior molares and adjoining bicuspidæ, in the form of a cap, to which the springs are to be attached, in the manner already mentioned.

Some other cases of a similar nature may occur, for which the practitioner will readily be enabled to provide, if he possess but ordinary mechanical knowledge.

I have thus far attempted to describe the mode of constructing

artificial teeth. The observations which I have made are entirely of a practical nature ; and nothing has been advanced but what has been substantiated by experience. If any part of the course which I have recommended shall be found to have been inadequately explained, I trust it will be attributed to the difficulty of imparting information in this manner, on a strictly manual art ; and that the justice will be done me, of believing that it does not proceed from any of those unworthy motives of concealment, by which so many of the profession are influenced.

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